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TRANSCRIPT OF RECORD.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1906

No. 3, ORIGINAL.

THE STATE OF KANSAS, COMPLAINANT,

vs.

THE STATE OF COLORADO ET AL., AND THE UNITED STATES, INTERVENOR.

IN EQUITY.

VOL. I.

BILL FILED MAY 20, 1901.

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At the Capitol of the United States in the city of Washington and District of Columbia, being the present seat of the National Government of the United States, on the second Monday of October (being the eighth day of the same month), in the year of our Lord one thousand nine hundred, and of the Independence of the United States the one hundred and twenty fifth, the Supreme Court of the United States met agreeably to law.

And afterwards, to wit, on the 13th day of May, A. D. 1901, the following entry appears of record, viz:

In the Supreme Court of the United States, October Term, 1900.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE COLORADO. } No. —.

Mr. Judson S. West, of counsel, for the complainant, submitted to the consideration of the court a motion for leave to file a bill of complaint herein, and leave was granted Mr. Charles C. Post, of counsel for the defendant to submit objections thereto.
May 13th, 1901.

Which said motion is in the words and figures following, viz:

In the Supreme Court of the United States

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO, Defendant.

Notice of Motion for Leave to File Bill in Equity.

The State of Colorado, the defendant above named, is hereby notified that the complainant above named, The State of Kansas, will on the sixth day of May, 1901, present to the Supreme Court of the United States, at its court room in the city of Washington, D. C., its motion for leave to file a bill of equity against The State of Colorado, a true copy of which motion is hereto attached marked "A" and made a part hereof, and a true copy of which bill in equity is hereto attached marked "B" and made a part hereof. In case the Supreme Court can not hear said motion on said date the same will be presented as soon thereafter as the court can hear it.

THE STATE OF KANSAS,
Complainant,
By A. A. GODARD,
Its Attorney General and Solicitor.

E. F. WARE,
Of Counsel.

STATE OF COLORADO, } ss:
Arapahoe County, }

Dewey C. Bailey, being first duly sworn says: I am United States marshal for the district of Colorado, and on the 13th day of April, 1901, I served the foregoing notice by delivering a true copy thereof together with a true copy of Exhibits "A" and "B" to Hon. James B. Orman, governor of the State of Colorado, at the city of Denver in said State, and I also delivered personally to Hon. Charles C. Post, attorney general of the State of Colorado, at the said city of Denver, on the 13th day of April, 1901, a true copy of the foregoing motion together with a true copy of Exhibits "A" and "B."

DEWEY C. BAILEY.

Subscribed and sworn to before me this 15th day of April, 1901.

CHARLES W. BISHOP,
[SEAL.] Clerk U. S. District Court, District of Colorado.

"A."

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO, Defendant. } No. —.

Motion for Leave to File Bill in Equity.

A. A. Godard, attorney general and solicitor for complainant.
E. F. Ware, of counsel.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO, Defendant. } No. —.

Motion for Leave to File Bill in Equity.

The State of Kansas, by its attorney general, appearing in that behalf by and with the authority, consent and direction of the governor of said State, comes now here and presents this its motion for leave to file in this court a bill in equity against the State of Colorado, and to have process issued thereon. A true copy of said bill is herewith exhibited to the court, and twenty-five copies thereof are now on file with the clerk of this court. And as the grounds of this motion, the said State of Kansas, complainant, shows to this honorable court:

1. That the State of Kansas is one of the United States of America, admitted into the Union January 29, 1861.

2. That the State of Colorado is one of the United States of America, admitted into the Union August 1, 1876.

3. That the Arkansas river rises in the Rocky mountains, in the State of Colorado, and flows in said State a distance of about two hundred and eighty miles, and thence into the State of Kansas, and that all tributaries entering it, in the State of Colorado, have their rise and entire flow in said State.

4. That during the winter season deep snows accumulate in said mountains in the State of Colorado, and within the drainage area of said river, which melting during the spring and summer, the waters therefrom flow directly and in great volume in said river, from early spring until the month of August in each year.

5. That the length of the course of said river in the State of Kansas is about three hundred and ten miles; and the volume of water in the bed of said river flowing from the State of Colorado into and through the State of Kansas formerly was, and should and would now be, very large but for the wrongful diversion of the same in and by the State of Colorado, as alleged in the bill.

6. That throughout its entire course in the State of Kansas said river flows through a broad valley of porous, alluvial deposits, commonly called "bottom lands," all of which, whether abutting upon said river or situated elsewhere in said valley, are, extending throughout the entire length and breadth thereof in the State of Kansas, underlaid with sand and gravel, through which the waters of said river have flowed time out of mind. All of said lands are exceedingly fertile and valuable when supplied with moisture.

7. That by reason of the meager and uncertain rainfall in said valley in the State of Kansas, the said underflow, which is almost entirely furnished and supplied by the water which flows and should flow in said river from the State of Colorado into the State of Kansas, is necessary for the growing and maturing of all cultivated crops, as well as of grasses and vegetation, in said valley within the State of Kansas.

8. That all the lands in said river valley in the State of Kansas were formerly and originally a part of the public domain of the United States, and title to all of said lands was acquired from the United States by settlers, grantees, and purchasers, in whom and in whose successors in interest the said title, together with all riparian and other rights appertaining to said lands, have remained at all times and are still vested. That the rights of the State of Kansas and of citizens of said State were acquired prior to the date of any claims to said waters made by or in — State of Colorado.

9. That at the time the title to said lands passed from the United States to said settlers, grantees, and purchasers, all the riparian and other rights of the common law attached to said lands as incident to said title.

10. That the State of Kansas is now and has been for many years

the owner and in actual possession and occupancy of two large tracts of land situate in said valley, one of which is located near the city of Dodge City, Kan., and abuts upon said river, and upon which the State of Kansas many years ago constructed and has ever since maintained a State institution known as "The Soldiers' Home"; and that the other of said two tracts of land is situated near the city of Hutchinson, Kan., upon which tract the State of Kansas constructed many years ago, and has at all times since maintained, a State institution used as an "industrial reformatory."

11. That each of said tracts of land so owned and occupied by the State of Kansas is used and cultivated by said State for the purpose of raising and producing thereon grain and vegetables, and of raising and maintaining thereon stock, for the use and support of said State institutions; and in order that said lands may be productive or useful for the purposes aforesaid, or for any other purpose, it is necessary that the said underflow of the Arkansas river beneath the surface of said lands be not impaired or diminished in any way.

12. That the State of Colorado has heretofore granted license and authority to persons, companies and corporations to construct ditches and canals for irrigation and other purposes, by means and as the result of which large portions of the water of the Arkansas river have been, and are still, diverted therefrom within the State of Colorado; that said waters so diverted have been, and are still, appropriated and consumed by said persons, companies and corporations so licensed and authorized, and are in no event returned or permitted to flow back into the channel of said river, but are used for the irrigation of arid non-riparian lands; and that by reason of said diversion of said waters the State of Kansas and thousands of its citizens, as owners of lands in said valley within the State of Kansas, are deprived of their rights to the flow and use of said water in the bed of said river and the said underflow of said river, and are for that reason greatly and irreparably damaged.

13. That the State of Colorado, in its own behalf, has constructed and is now constructing large ditches, canals and reservoirs for the purpose of diverting and storing thereby and therein, within the State of Colorado, practically all of the water flowing or that would otherwise flow in the channel of said Arkansas river, and for the purpose of using and appropriating said water for irrigation and other uses upon lands not riparian nor adjacent to said river, and with the effect that none of said water so diverted, stored and used is or will be returned to the channel of said river, or to the use and benefit of the State of Kansas or its citizens owning and occupying lands in the valley of said river in said State, as aforesaid.

14. That the State of Colorado threatens to divert and appropriate as aforesaid all of the waters of said Arkansas river within the State of Colorado, and will so divert and appropriate the same unless restrained therefrom, to the great and irreparable loss and damage and in utter disregard of the rights of the State of Kansas and of its citizens.

15. That if the State of Colorado is permitted to divert and appropriate the waters of said river as aforesaid, the lands of the State of Kansas hereinbefore mentioned, as well as the lands of the thousands of citizens of said State, situate in said valley within the State of Kansas, will be thereby greatly impaired in value and usefulness, and will be rendered practically unfit for the production of crops, and for the growth of grasses, fruits, and other vegetation, or for any other purposes to which said lands have been heretofore and should now and hereafter be devoted.

16. That the common law relative to riparian rights is now and has been in full force in the States of Kansas and Colorado since long before their admission into the Union; and the diversion and appropriation of the waters of the Arkansas river by and in the State of Colorado, as aforesaid, has been, and is and will be wrongful, and in utter disregard and violation of the rights and interests of the State of Kansas and of its citizens.

17. That as a necessary result of the diversion and appropriation of the water of said river by and in the State of Colorado, as aforesaid, thereby causing the water of said river to cease flowing in its natural channel, normal volume and under the surface of said lands within the State of Kansas, the owners and occupants of lands in said valley are and will be wholly deprived of water necessary for domestic use and for watering animals; and the atmosphere in the vicinity of said river will be deprived of the moisture necessary to the health and well-being of the inhabitants.

18. That, unless complainant be permitted to file its bill herewith submitted and to obtain in this court, and by suit in equity therein, a decree enjoining the State of Colorado from doing the things complained of, complainant is remediless, and defendant can and will destroy the value of complainant's property to the extent of many thousands of dollars, and the property of citizens of Kansas to the extent of many millions of dollars, and the revenues of said State will be greatly impaired, all in violation of complainant's rights and the rights of said citizens, and in the absence of any right or authority for so doing.

A. A. GODARD,
Attorney General, and Solicitor for Complainant.

E. F. WARE,
Of Counsel.

(A copy of the bill of complaint, marked B, followed, but is not here printed because printed hereafter.)

[Endorsed:] Supreme Court U. S. October term, 1900. Term No. 19, original. The State of Kansas, complainant, vs. The State of Colorado. Motion for leave to file bill of complaint with notice of motion and proof of service of same and copy of bill. Submitted May 13, 1901. Filed May 20, 1901.

And afterwards, to wit, on the 20th day of May, A. D. 1901, the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1900.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO.

On consideration of the motion for leave to file a bill of complaint herein,

It is now here ordered by the court that said motion be, and the same is hereby, granted and that a subpœna returnable on Monday, October 14th next be issued and served herein.

May 20th, 1901.

And on the same day, to wit, the 20th day of May, A. D. 1901, the bill of complaint was filed in the words and figures following, viz:

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO, Defendant. } No. —.

Bill in Equity.

A. A. Godard, attorney-general of the State of Kansas.
E. F. Ware, of counsel.

In the Supreme Court of the United States.

To the Honorable the Chief Justice and the associate justices of the Supreme Court of the United States:

Your orator, the State of Kansas, brings this its bill of complaint against the State of Colorado, and avers:

1. The State of Kansas is one of the United States of America, admitted into the Union January 29, 1861. The State of Colorado is one of the United States of America, admitted into the Union August 1, 1876.

2. This bill is exhibited and these proceedings are had by direction of Honorable W. E. Stanley, the duly elected, qualified and acting governor of the State of Kansas.

3. Your orator further says: The Arkansas river rises in the Rocky mountains, in the said State of Colorado, and flows from its source through the counties of Lake, Chaffee, Fremont, Pueblo,

Otero, Bent, and Prowers, in said State, and thence from the last-named county across the line into the State of Kansas.

All tributaries entering the Arkansas river in the State of Colorado have their rise and entire flow in that State. The length of the river in the said State is, approximately, two hundred and eighty miles, and the drainage area of said river and its tributaries in the said State is, approximately, twenty-two thousand square miles. All of the drainage area of said river is east of the summit of the Rocky mountains, and a large portion of such area is in the mountains, where the fall of the snow in the winter season is very great. Deep snows accumulate during the winter season in said mountains and the valleys thereof, which snow melting during the spring and summer, the waters therefrom flow into the river directly and in great volume from the early spring until the month of August in each year. The course of said river, after leaving the mountains of Colorado, proceeds in an easterly direction for, approximately, two hundred miles to the west line of the State of Kansas; and the river in its course, after leaving the mountains, is a navigable stream under the laws and departmental rules and regulations of the United States.

The volume of water in the bed of said river flowing from the State of Colorado into the State of Kansas formerly was, and should now be, and would be, very large, but for the wrongful diversion of the same as hereinafter set forth; said volume at its normal height in said river at the mean average flow, for about ten months in the year, being upwards of two thousand cubic feet per second. For a period of about two months in the autumn of each year the normal flow of water in the bed of said river shrinks and is much less than the amount above stated. The tributaries of said river in the State of Kansas are comparatively few in number, and do not and could not furnish water to cause a continuous stream to flow in the bed of the said river, except near the south line of the State where the river flows into the Territory of Oklahoma.

The said river flowing from the State of Colorado enters the State of Kansas and proceeds through the counties of Hamilton, Kearny, Finney, Gray, Ford, Edwards, Pawnee, Barton, Rice, Sedgwick, Sumner, and Cowley, in the State of Kansas, and therefrom through the Territory of Oklahoma, the Indian Territory, and the State of Arkansas, and empties into the Mississippi river at the eastern boundary of that State. From Fort Gibson, in the Indian Territory, to the mouth of said river it is a large, navigable stream, and is used for the purposes of trade and commerce by vessels plying thereon.

The length of the river in the State of Kansas is about three hundred and ten miles. Its course is through a broad valley, and along its entire length within the State of Kansas are alluvial deposits of great depth, amounting, in the aggregate, to about two million five hundred thousand acres. The greater part of the said acreage and the greater part of the course of the river lies in the western half of

the State. The elevation of the bed of the river through the State of Kansas is from three thousand three hundred and fifty feet above the level of the sea, at the Colorado line, to one thousand feet above said level at the point where it enters Oklahoma. The rainfall in the drainage area of said river in the western half of the State of Kansas is very light, and, by reason of the porous nature of the soil throughout said drainage area, the greater portion of the water so falling sinks into the earth, and but a small portion thereof finds its way to said river, except in the event of severe and unusual storms. The ordinary and usual rainfall in the major portion of the valley of said river in the State of Kansas is utterly inadequate to the growing and maturing of cultivated crops of any kind, because, *first*, the pre ipitation is very scanty; and, *second*, it does not fall during the growing season of the year.

The said river in its entire course through the State of Kansas has a natural fall of about seven and three-tenths feet per mile. The valley of the river is composed of sand covered with alluvial soil, and the river and the surface soil of the bottom lands in the State of Kansas are all underlaid with sand and gravel, through which the waters of said river have flowed from time immemorial, extending in width under the entire valley for its whole length through the State of Kansas. The natural course and flow of said river throughout its entire length in the State of Kansas is in and beneath the bed thereof and beneath the surface of the bottom lands of the entire valley of said river. That portion of the river which flows beneath the surface through the sand and gravel is called the "underflow." The "underflow" is confined to the valley of the river and is coextensive with the valley, and varies in volume with the amount of water in discharge in the river. The water which flows in the river from the State of Colorado into the State of Kansas furnishes the principal and almost the entire supply of water for the underflow in the valley of said river, and at its normal height the said underflow is of great and lasting benefit to the said bottom lands, both as to those which abut upon said river and as to those which do not; and is of great benefit to the people owning and occupying such lands, for that it furnishes moisture sufficient to grow ordinary farming crops in the absence of rainfall, and furnishes water, at a moderate depth below the surface, for domestic use and for the watering of animals. The flow of water in the river-bed is also of great value to the people in the vicinity by reason of the fact that the evaporation from said river tends to cool and moisten the surrounding atmosphere, thereby greatly promoting the growth of all vegetation, enhacing the value of lands in that vicinity, and conducing directly and materially to the public health and making the locality habitable. Owing to the dryness of the climate, the cloudlessness of the sky, the high elevation, and the prevailing winds, evaporation is rapid and great, being about sixty inches per annum at the east end of the river valley in Kansas, and ninety inches at the west line of the State.

Outside of said valley in the western half of the State of Kansas are several million acres of arid upland and plateau upon which grows a sparse but valuable grass upon which cattle may feed, and upon which they have, in times past, in vast numbers been fed and fattened, but the cattle so fed must have watering-places, and such watering-places must be in the river valley. And the availability and use of the said arid lands and the prosperity of the business of cattle-feeding thereon depends entirely upon the water, its convenience, depth, and supply, and if the surface flow of water in the bed of said river be wholly cut off from the State of Kansas, then the underflow will gradually diminish and run out, and the valley of the Arkansas river will become as arid and uninhabitable as is the upland and plateau along its course, since without said underflow the valley land will be unfit for cultivation and the said lands unavailable for grazing.

The bottom lands in the valley of the Arkansas river in the State of Kansas are practically level and rise from six to fifteen feet above the water bed of the river, and are such as are ordinarily termed and will be herein referred to as "bottom lands." Nearly all of said bottom lands, including those which are adjacent to the bed of said river, are fertile and productive, valuable for farming purposes, and well adapted to the growing of corn, wheat, alfalfa, rye, domestic and wild grasses, orchards, fruits, vegetables, and all like crops, grains and grasses usually grown in that latitude of the United States. In addition thereto, all of said lands are valuable for grazing purposes and well adapted to the support of vast numbers of cattle, horses, sheep, and hogs.

Nearly all of the bottom lands of the said Arkansas valley, including those upon the banks of said river, are now owned, held and occupied by persons engaged in agricultural pursuits, and more than three-fourths of the bottom lands of said valley in the State of Kansas were and are occupied by persons owning or leasing said lands and residing thereon with their families. More than two-fifths of said bottom lands so situate in said valley in the State of Kansas, including more than two-fifths of those upon the banks of said river, are in a state of actual cultivation, and have been for many years past; and said lands now have, outside of the cities, an agricultural population of more than fifty thousand persons. The inhabitants of said valley are now, and have been since the first settlement thereof, as hereinafter set forth, engaged in the raising of corn, wheat, rye, alsalfa, hay, fruits, vegetables, cattle, horses, sheep and hogs and other products common to the latitude and climate.

Situated upon the banks of the said river in the State of Kansas are numerous cities, towns, and villages, and among the cities so situated are Syracuse, Garden City, Cimarron, Dodge City, Kinsley, Larned, Great Bend, Sterling, Hutchinson, Wichita, and Arkansas City; all of which cities, except the one last named, are county-seats, and have an aggregate population of over 50,000 persons,

whose rights are to a greater or less extent impaired by the wrongs herein complained of.

The actual value of the bottom lands in the valley of the Arkansas river, in the State of Kansas, is from five to one hundred dollars per acre, and the average value of all of the said lands is not less than twenty-five dollars per acre, provided said lands are permitted to receive the benefits arising from the natural and normal flow of water in said river, which benefits they would receive but for the wrongful acts done in and by the State of Colorado. By reason of the said wrongs, herein complained of, the value of said lands has shrunk many millions of dollars, which has been a direct loss to the citizens of the State of Kansas, and to the taxable wealth, and to the revenues of the State of Kansas and to the school system of the State as hereinafter set forth.

4. Your orator further says: All of the said bottom lands were originally a part of the public domain of the United States, and by the act admitting the State of Kansas into the Union the State became entitled, for school purposes, to sections sixteen and thirty-six of each governmental township, some of which sections are situated within the said valley, and a number of which adjoin the bed of said stream.

Under the act of Congress of March 3, 1863, entitled "An act for a grant of lands to the State of Kansas in alternate sections to aid in the construction of certain railroads and telegraphs in said State," there was granted to the State practically all of the odd-numbered sections of land in said valley lying north of a line four miles south of the north line of township twenty-six in said State. Said line is about four miles north of the city of Wichita, and extends to the west line of said State; and the grant included all the territory of the Arkansas valley west of Wichita, being four-fifths of said valley. All the requirements and provisions of said act of Congress were complied with prior to the year 1874 by the State of Kansas and by the Atchison, Topeka & Santa Fe Railroad Company, as to such of said lands as were located east of the west line of Ford county in said State as now located. Prior to the year 1874, the fee-simple title to said lands and all rights thereunto appertaining had been certified and conveyed by the United States to the State of Kansas, and by it to the said railroad company.

Between the years 1874 and 1883 the remaining sections of said lands, to wit, those lying west of said west line of Ford county, were so certified, transferred, and conveyed to said State and by it conveyed. The amount of the lands so conveyed, which were situate in said valley and were a part of the bottom lands thereof, was not less than nine hundred thousand acres, a large portion of which abut upon and extend to the bed of said river. The other lands in said valley, being the even-numbered sections, were and have been at all times subject to entry as a part of the public domain of the United States and subject to be taken and occupied by settlers thereon, under the land laws of the United States.

Prior to the admission of the State of Kansas into the Union, in 1861, many persons were settlers and residents of said valley, occupying and holding lands therein, more particularly along the line of the Santa Fe trail, which followed the river from a point near the present site of the city of Hutchinson to the west line of the State. During the years 1869, 1870, and 1871, the entire Arkansas valley, from the south line of the State of Kansas to the city of Great Bend, was taken and occupied by actual settlers, who subsequently acquired title to their lands under the laws of the United States of America and by purchase from the State and the said railroad company. The other lands situated in said valley from Great Bend westward to the west line of the State of Kansas, were taken up during the time between the years 1872 and 1884 and have been occupied ever since by actual settlers and by purchasers from the State and from the said railroad company. All of the lands of said valley have been thus occupied, held and owned by said original settlers and their grantees ever since the above dates of settlement, and these settlers and their successors in interest have continuously held and owned, and do now hold and own, all of the riparian and other rights of every kind and nature in any way appertaining or belonging to said lands.

5. Your orator further says: By an act of the Congress of the United States of March 2, 1889, it was enacted that the Secretary of the Interior be authorized to sell and convey to the State of Kansas lots numbered three, five, six, and seven, of section three, township twenty-seven south, of range twenty-four west, situated in Ford county, Kansas, on condition that the State should within twelve months thereafter pay or cause to be paid the sum of one dollar and twenty-five cents per acre for said lands, and should within three years establish and provide for the maintenance thereon of a home for the care and maintenance of officers, soldiers, sailors and marines who had served in the army and navy, and their dependent parents, widows, or orphans. Thereafter, and on the 13th day of June, 1889, the State of Kansas made payment to the United States of one dollar and twenty-five cents per acre for said lands, and on said date they were by the Secretary of the Interior, in pursuance of said act of Congress, transferred to the State of Kansas, and it has ever since used said lands for the maintenance of a soldiers' home thereon, in accordance with the provision of the aforesaid act of Congress. The lands so used consist of one hundred and twenty-six and fifty-six one-hundredths acres of the bottom lands of the Arkansas valley, adjoining and abutting upon the bed of said river. Said land is fertile and of a character well adapted to the raising of grain, fruits and vegetables when supplied with moisture. The natural rainfall in the vicinity is slight and insufficient for the maturing of crops, fruits, and vegetables, and the value of said lands for farming purposes depends entirely upon the flow of water in the bed of the river and upon the underflow beneath the land. The State of Kansas is now —, and has, dur-

ing its entire ownership of said tract, used a large portion of the same for the raising of grains, fruits, vegetables and grasses thereon for the needs of its said institution, and as the owner of said land, the State of Kansas, is now and has been since 1889 entitled to the full, free and natural flow of all waters which naturally would flow in said river and beneath said land; and the rights of the State thereto are prior and superior to any right or claim of the State of Colorado accruing, acquired or established subsequent to said date.

6. Your orator further says: The State of Kansas is the owner of the fee-simple title to the northeast quarter (¼), the east half of the northwest quarter (¼), the southwest quarter (¼), and the southeast quarter (¼) of section nineteen (19), and the south half of the southeast quarter (¼) of section eighteen (18), all in township twenty-three (23) south, range five (5) west of the sixth principal meridian, situated in Reno county, Kansas, and has owned said lands since the year 1885. The State of Kansas has erected upon said lands a large institution built and used for the purpose of an industrial reformatory, where are confined and detained large numbers of the criminals of the State. The greater portion of the said lands so owned by the State are suitable for and are used for farming purposes in connection with said institution, and for the growing of grain, grasses, fruits and vegetables for the needs of said institution. Said lands consist of about six hundred and forty (640) acres, and are situated within the valley of the Arkansas river, and are bottom lands furnished with moisture, sufficient for the growing of crops thereon, solely from the underflow of said river, and the rainfall upon said lands in ordinary seasons is naturally inadequate.

The State of Kansas acquired the title to said reformatory lands from divers persons and individuals who had previously owned and occupied them, and the title to all that portion of said lands situate in section nineteen passed from the United States to the State of Kansas under and in pursuance of the act of Congress approved March 3, 1863, granting certain lands to the State of Kansas to aid in the construction of certain railroads, and said lands were located and were certified to the State of Kansas April 9, 1873; and on the 19th day of May, 1873, the said section of land, with other lands, were patented by the State of Kansas to the Atchison, Topeka & Santa Fe Railroad Company. In and by said of Congress and the certification and location of said lands thereunder and the patent aforesaid, the full fee-simple title to said lands and all rights appertaining thereto were transferred from the United States of America to said railroad company, and said title and rights have passed by successive conveyances through various parties to the State of Kansas, and were acquired by it on August 14, 1885, as aforesaid, and have been ever since held by it. The title to that portion of said reformatory lands situate in section eighteen passsed from the United States to one George S. Laverty, by a patent dated September 25, 1878, at which time said Laverty acquired the fee-simple title to said premises and all rights appertaining thereto, all of which

relate back to and date from the time of his entry upon said lands, more than five years prior thereto. Said title and rights in and to said lands have passed by successive conveyances until they are now vested in the State of Kansas as aforesaid; and the State is now, and has been since August 15, 1885, the owner in fee simple of said tract of land and all rights thereunto appertaining. By reason of the foregoing, the State of Kansas is entitled to the full natural flow of the water of the Arkansas river in its accustomed place and at its normal height and in its natural volume underneath all of the said reformatory lands. The rights of the State thereto relate back to May 19, 1873, and are prior and superior to any right or claim of the State of Colorado accruing, acquired or established subsequent to said date.

7. Your orator further says: By the constitution of the State of Colorado, adopted at or about the time of the admission of said State into the Union, and not since abrogated by the people of said State, it is provided in article fifteen thereof as follows:

"SEC. 5. The water of every natural stream not heretofore appropriated within the State of Colorado is hereby declared to be the property of the public, and the same is dedicated to the uses of the people of the State subject to appropriation as hereinafter provided.

"SEC. 6. The right to divert unappropriated waters of any natural stream for beneficial uses shall never be denied. Priority of appropriation shall give the better right as between those using the water for the same purposes; but when the waters of any natural stream are not sufficient for the service of all, those using the water for domestic purposes shall have the preference over those claiming for any other purpose, and those using the water for agricultural purposes shall have the preference over those using the same for manufacturing purposes."

The legislature of the State of Colorado has from time to time passed divers and numerous laws purporting and pretending to authorize the diversion of water from said Arkansas river and its tributaries, in said State, for uses and purposes other than domestic; more particularly for the purpose of irrigating arid and waste lands for agricultural purposes in said State. In and by its said laws and through its officers and courts the said State has pretended to grant to divers persons, firms and corporations the right and authority to divert the waters of the Arkansas river and its tributaries, in Colorado, from their natural channels, and to cause said waters to flow into and through canals and ditches constructed for the purpose, extending great distances away from the natural channels of said streams, and to store said waters and to empty the same upon high arid lands, not riparian to said streams, where large portions of such waters are lost from evaporation, and the remainder sinks into the earth, as a result of which, all of said waters are forever lost to such streams and are thus and thereby prevented from flowing into or through the State of Kansas.

Under and in pursuance of said constitutional provisions and the

statutes of the State of Colorado, upwards of one hundred and fifty persons, firms and corporations claim to have acquired rights to divert water from said river and its tributaries, in the State of Colorado, for the purpose of irrigating such arid non-riparian lands in said State; and each of said persons, firms and corporations owns one or more ditches or canals to carry said waters from the natural courses of said streams. Many of said canals and ditches are of great capacity, and are many miles in length. Many of said persons, firms and corporations have constructed great reservoirs within which to store, and in which are stored for use, vast quantities of the water of said streams before using it for the purpose of irrigation, as herein set forth.

Said ditch owners, together with the State of Colorado, as hereafter set forth, are now diverting and at all times continue to divert from their natural courses the waters flowing in the bed of the Arkansas river and its tributaries, in said State, and are now carrying said waters to great distances from their natural courses and discharging them for agricultural purposes upon arid and non-riparian lands, where such waters are wholly lost to such streams and to the State of Kansas and its inhabitants. That such diversion is carried to such an extent that no water flows in the bed of said river from the State of Colorado into the State of Kansas during the annual growing season, and the underflow of said river in Kansas is diminishing and continuing to diminish, and if the said diversion continues to increase, the bottom lands of said valley will be injured to an enormous extent, and a large portion thereof will be utterly ruined and will become deserted and be a part of an arid desert.

The State of Colorado, through its laws, legislatures, officers, and agents, pretends to authorize and license the owners of said canals and ditches to take, carry away and so use the waters of said streams; and the State of Colorado, in addition to granting the right to take and use the water, also claims the right to regulate and control the distribution of such water by canal and ditch owners to the owners of lands so irrigated, and grants permission and license to land owners of said State to take and receive the waters flowing in said canals and ditches and use the same for irrigation purposes. In addition to the foregoing, other canals and ditches for the diversion of waters from said river and its tributaries are contemplated for the purpose of irrigating non-riparian lands; and the extension of branches and laterals to those canals and ditches now built are contemplated and intended by the people of the State of Colorado; as is also the obtaining of additional privileges not heretofore granted for the diversion of water from said river, and its tributaries, and the irrigation of lands not now irrigated. The extension of said irrigation system in the drainage area of the Arkansas valley, in the State of Colorado, is being continuously carried on; and unless restrained therefrom the State of Colorado will grant additional rights or pretended rights for the construction of other canals and ditches

sufficient to divert all the water in the river, so that none will flow into the State of Kansas.

The State of Colorado has, since the year 1890, at and near the city of Cañon City, in said State, constructed a great canal for the purpose of diverting water of the Arkansas river from its channel at said point and using the water for irrigation purposes upon arid non-riparian lands, so that the water will not return to or again flow in said river; which said canal is now owned, controlled and managed by the State of Colorado. The said State authorizes, directs and permits its agents and employees so to divert from said river into said canal water to the amount of seven hundred and fifty-six $\frac{25}{100}$ cubic feet per second, thereby greatly diminishing the flow of water in the river, which said amount is approximately the natural flow of said river at the place of said diversion. The diversion of said water from said river through said canal is continued during the entire season within which annual crops are grown and matured in the State of Kansas and throughout the entire season in which the water is needed in the State of Kansas; and said water so diverted and taken, is sold by the State of Colorado to persons owning lands in the vicinity of said canal, and the water is used by such owners for irrigating such arid non-riparian lands. The waters so diverted from said river by the State of Colorado would otherwise flow into the State of Kansas and through said valley, and be vastly beneficial.

The State of Colorado intends and is threatening to build, and will build or cause to be built, unless restrained therefrom, other canals similar in size, character, and design, with the purpose and intention of forever diverting other large quantities of water from said river and irrigating other arid non-riparian lands, and the legislature of the State of Colorado has authorized the construction of other such canals along the river in said State. The said canal constructed by the State of Colorado is not yet completed, and only a portion of the arid non-riparian lands subject to irrigation therefrom, as it is now constructed, is receiving water from said canal. The State of Colorado intends to, and will, unless restrained by this court, extend said canal and build branches and laterals thereto, and will use water diverted from said river to irrigate arid non-riparian lands not now or ever previously irrigated.

The said State of Colorado has, by and through legislation, made large appropriations of money for the construction and erection of reservoirs within its territory for the storage of water from streams tributary to the Arkansas river in said State, and has provided boards of control to have charge of the construction, maintenance and operation of such reservoirs, and has provided that the waters so stored in reservoirs may be sold and disposed of for the purpose of being used in the irrigation of lands which are arid and non-riparian to the streams from which such waters are taken. And your orator further states, upon information and belief, that the said State of Colorado has since the year 1891 erected and constructed

and is now using not less than four of such reservoirs—one in each of the counties of Custer, El Paso, Chaffee, and Las Animas—each of which reservoir takes, stores and holds vast quantities of water which would otherwise flow into the State of Kansas; and, by reason of the use of said waters as aforesaid, no portion thereof is permitted to return to its natural channel or flow in said river.

The said State of Colorado is now preparing to construct and intends to construct, and unless restrained therefrom will construct, within its territory and near the said river and its tributaries, and at various points along the valley thereof, vast reservoirs within which to further store and hold the natural and the flood waters of said stream; and it is the intention and expectation of said State so to store and withhold and divert from the channel of said river all of the water thereof. And your orator states, upon information and belief, that surveys for such reservoirs have been made, and plans and specifications are being prepared for the construction of such reservoirs, and the State is preparing to enter upon the construction thereof. If said reservoirs are so constructed by the State of Colorado, vast and enormous quantities of water which would otherwise flow in the river into the State of Kansas will be taken and held, and will be sold and used for the irrigation of arid and non-riparian lands not now irrigated, and will be forever lost to said river and the State of Kansas. Such an event will cause great distress in the State of Kansas in said valley, and will cause a vast and ruinous decline in agricluture, and great diminution in the wealth and revenues of the State of Kansas, and a great diminution in its population and prosperity. And your orator believes, and so charges the facts to be, that it is the intention of the State of Colorado to divert absolutely all of the water that does, can or might flow down the Arkansas river into the State of Kansas, so that all of the water shall be used in the State of Colorado, and none whatever, either above or below the surface, that may by any possibility be utilized, shall cross the line into the State of Kansas, all to the great profit and advantage of the State of Colorado; and to the great damage and injury of the State of Kansas.

When the Territory of Kansas was organized, in the year 1854, it extended from its present eastern boundary to the summit of the Rocky mountains, and all of the present drainage area of the Arkansas river in Colorado was then included in the Territory of Kansas, and during all of the period from then to the organization of the State of Kansas the water of said river was wholly unappropriated, and the common law and the riparian rights herein claimed extended over the whole of the Arkansas valley and to the summits of the Rocky mountains, and had for many years prior thereto. By reason of the prior settlement, occupation and title of the inhabitants of the State of Kansas upon and to the lands situate in the valley of said river, including those upon the banks of said river, the State of Kansas and the owners of land in said valley did acquire, and now have the right to, the uninterrupted and unimpeded

flow of all of the waters of said river into and across the State of Kansas. The rights so claimed by your orator accrued prior to any of the said diversions by or in the State of Colorado, and prior to the accruing of any of the pretended rights claimed by the State of Colorado, or by persons, firms or corporations now taking water from said river or its tributaries.

8. Your orator further says: The State of Colorado and the various persons, firms and corporations engaged in taking waters from said river and its tributaries as aforesaid, under and in pursuance of authority and license pretended to be granted therefor by the State of Colorado, have by so doing wrongfully, illegally and unlawfully diverted said water from the accustomed channel into and across the State of Kansas, and have greatly damaged and have irreparably injured the State of Kansas and the inhabitants thereof. And by reason of said diversion of water the fertility of all of the lands in said valley, including those upon the banks of said river as well as others, has been greatly diminished. During the spring and early summer, when crops are growing upon said valley lands in Kansas, the diversion of water in Colorado, as aforesaid, withholds from said Kansas Valley lands, and particularly those upon the banks of said river, and those belonging to the State of Kansas above described, the water to which said lands are entitled, with the result that the crops, trees and vegetation growing thereon languish and decline and in many places wither and perish; and wells which should furnish water for domestic use and animals become dry. The said damages are the proximate and necessary result of the diversion of said waters as aforesaid; and the amount of such damage is enormous and beyond computation, and amounts to vast sums annually, and such damages have increased year by year for the past ten years, substantially in proportion as the diversion of said waters in the State of Colorado has increased. If said persons, firms and corporations be permitted to increase the amount of water which they shall take from said river and its tributaries in Colorado, or if other persons, firms or corporations be permitted to take additional water from said river and its tributaries, the damage suffered, as aforesaid, by the State of Kansas and the inhabitants of said valley will continue to increase.

The property of your orator situated upon the banks of the river near Dodge City, and used for the purpose of a soldiers' home, as aforesaid, has been greatly damaged and specially injured by reason of the diversion from its channel of the water which would otherwise flow in the said river by and underneath the said tract of land. Its fertility has been greatly diminished, its water supply lessened, and its salubrity and utility impaired, and unless the natural and normal flow of water is restored, the value of said property will be entirely destroyed, and the same will be entirely destroyed, and the same will be rendered unfit for use as a soldiers' home, or for any purpose whatever. And the same is true of the property of your orator situate near the city of Hutchinson, and

used for the purpose of a State industrial reformatory. If greater amounts of water are to be taken from said river in the State of Colorado, and if the water flowing therein shall be retained and used in said State by the owners of canals and ditches or by the State of Colorado, the value of said land will be taken away and the utility of said institution wholly destroyed.

That by reason of the diversion of said waters, as herein described, during the summer season and during the dry portion of the year, when there is neither rainfall in the State of Kansas nor melting snows in the State of Colorado, the bed of said river in the State of Kansas above the city of Wichita becomes practically and oftentimes wholly dry. The bed of said stream, through the territory above described, is without high banks, and, in its natural condition, was but a few inches or a few feet below the bottom lands adjacent thereto. These adjacent bottom lands are of a loose, sandy loam, and are unprotected on either side by hills or mountains, or by any natural forests, and the bed of said stream is almost wholly of sand. During said dry portion of the year said territory is subject to high and constant winds, and said winds change and fill up the bed of the stream and the natural channel thereof with drifting sand, dirt, and debris, until it is practically level with the lands adjacent thereto, and said obstructions are rapidly becoming permanent by growing vegetation, willows, and trees. And at the times of sudden and excessive rainfall in the State of Kansas, or sudden and excessive melting of the snows in the State of Colorado, the flood waters thereof cannot and do not flow down the natural channel of said river, now filled and obstructed as aforesaid, but overflow said adjacent bottom lands, washing channels therethrough, depositing dirt and debris thereon, and doing great damage to stock pastured, crops grown and improvements situate thereon, and greatly injuring and decreasing the value of said lands.

9. Your orator further says: A large number of the irrigation canals and ditches now wrongfully used as aforesaid in diverting the waters of the Arkansas river and its tributaries from their accustomed channel in said State of Colorado are owned and operated by domestic corporations organized for that purpose under the laws of the State of Colorado, with limited periods of existence. If the State of Colorado be not restrained from so doing, it will, at or about the termination of the existence of such corporations, grant unto them new charters or extensions of the charters now held; and said State will, unless restrained by this court, grant other and new charters to corporations organized for the purpose of unlawfully and wrongfully diverting and using said waters for irrigation purposes, all to the great damage and irreparable injury of the State of Kansas and its inhabitants.

10. Wherefore, your orator prays the aid of this honorable court, and asks that a decree may be entered prohibiting, enjoining and restraining the State of Colorado from granting, issuing, or permitting to be granted or issued hereafter, any charter, license, permit or

authority to any person, firm or corporation for the diversion of any of the waters of the Arkansas river or of any of its tributaries from their natural beds, courses and channels within the State of Colorado, except for domestic use; and from granting to any person, firm or corporation any right to extend or enlarge any of the canals or ditches now existing; or to construct and operate any other canals, ditches, branches, laterals or reservoirs in addition to those heretofore constructed and now in use in said State.

Your orator further prays, that the said State of Colorado may be prohibited, enjoined, and restrained, as a State, from itself constructing, owning, or operating, either directly or indirectly, any canal or ditch whereby the waters of said river, or any of its tributaries, shall be diverted from their natural courses and channels; and from constructing, owning, operating or using any reservoir for the storage of the waters of said river, or any of its tributaries, for purposes of irrigation.

Your orator further prays, that the said State of Colorado may be prohibited, enjoined and restrained from granting to any person firm or corporation any extension of any charter, license, permit, or authority, of any kind or nature whatsoever, for the diversion of any of said waters from said river or its tributaries for irrigation purposes, or for the continuance of such diversion thereof after the charter, license, permit or authority theretofore granted for that purpose shall have expired.

Your orator further prays, that it may have such other and further relief in the premises as the nature of the circumstances of this case may require and as to this honorable court shall seem meet.

Forasmuch, therefore, as your orator is without remedy in the premises except in a court of equity, may it please your honors to grant unto your orator not only a writ of injunction conformable to the prayer of this bill, but also a writ of subpœna of the United States of America directed to the State of Colorado, to be served upon the governor and attorney general of said State, commanding it on a day certain, therein to be named, and under a certain penalty, to be and appear before your honorable court, then and there to answer all and singular the allegations of the foregoing bill, and to abide and perform such order and decree in the premises as may be awarded against the said State.

And your orator, as in duty bound, will ever pray, etc.

A. A. GODARD,
Attorney General of the State of Kansas,
and Solicitor for Complainant.

E. F. WARE,
S. S. ASHBAUGH,
Of Counsel.
J. S. WEST,
Ass't Att'y General.

[Endorsed:] Supreme Court U. S. October term, 1900. Term No. 19, original. The State of Kansas, complainant, vs. The State of Colorado. Bill of complaint. Filed May 20, 1901.

And on the same day, to wit, on the 20th day of May, A. D. 1901, an order for appearance for complainant was filed in the words and figures following, viz:

Order for Appearance.

Supreme Court of the United States, October Term, 1900.

THE STATE OF KANSAS, Comp't,
vs.
THE STATE OF COLORADO.
} No. 19, Orig'l.

The clerk will enter my appearance as counsel for the complainant.

(Name.) A. A. GODARD,
(P. O. Address.) Topeka, Kansas.

E. F. WARE, Topeka, Ks.,
S. S. ASHBAUGH, Wichita, Ks.,
J. S. WEST, Topeka, Ks.,
Of Counsel.

☞NOTE.—Must be signed by a member of the bar of the Supreme Court of the United States. Individual and not firm names must be signed.

[Endorsed:] Supreme Court U. S. October term, 1900. Term No. 19, orig'l. Appearance for The State of Kansas, complainant. Filed May 20, 1901.

And afterwards, to wit, on the 23d day of May, A. D. 1901, a subpœna was issued and delivered to the marshal for service.

And afterwards, to wit, on the fourth day of June, A. D. 1901, the subpœna, and proof of service of same, was filed in the words and figures following, viz:

THE UNITED STATES OF AMERICA, *ss:*

The President of the United States of America to the State of Colorado, Greeting:

[SEAL.] For certain causes offered before the Supreme Court of the United States, having jurisdiction in equity, you are hereby commanded that laying all other matters aside and notwithstanding any excuse, you be and appear before the said Su-

preme Court holding jurisdiction in equity, on Monday, the 14th day of October, 1901, at the city of Washington, in the District of Columbia, being the seat of the National Government of the United States, to answer unto the bill of complaint of the State of Kansas in the said court exhibited against you.

Hereof you are not to fail at your peril.

Witness the Honorable Melville W. Fuller, Chief Justice of the United States, at the city of Washington, the 23d day of May, A. D. 1901.

JAMES H. McKENNEY,
Clerk of the Supreme Court of the United States.

Endorsed: Supreme Court, U. S. October term, 1900. No. 19 original. The State of Kansas, complainant, v. The State of Colorado. Subpœna.

Office of the Marshal, Supreme Court of the United States, Washington, D. C.

Supreme Court of the United States, October Term, 1900.

THE STATE OF KANSAS
—
THE STATE OF COLORADO. } No. 19, Original. Marshal's Return on Subpœna.

The within subpœna came to my hand May 25, 1901 and on June 1, 1901, was duly served on the State of Colorado by acceptance of service of same by the *the* governor of said State and by the attorney general of said State as witnessed by their signatures to said acceptances attached hereto. And thereupon I have duly mailed to said governor and to said attorney general each a duly certified copy of the bill of complaint herein. Of all which I make this return at the city of Washington, this fourth day of June 1901.

J. M. WRIGHT,
Marshal Supreme Court U. S.

THE UNITED STATES OF AMERICA, *ss:*

The President of the United States of America to the State of Colorado, Greeting:

[SEAL.] For certain causes offered before the *the* Supreme Court of the United States, having jurisdiction in equity, you are hereby commanded, that laying all other matters aside and notwithstanding any excuse, you be and appear before the said Supreme Court holding jurisdiction in equity on Monday, the 14th day of October, 1901, at the city of Washington, in the District of Columbia, being the seat of the National Government of the United

States, to answer unto the bill of complaint of the State of Kansas in the said court exhibited against you.

Hereof you are not to fail at your peril.

Witness the Honorable Melville W. Fuller, Chief Justice of the United States, at the city of Washington, the 23d day of May, A. D. 1901.

(Signed) JAMES H. McKENNEY,
Clerk of the Supreme Court of the United States.

STATE OF COLORADO, *ss:*

Service of the process, of which the above is a copy, is hereby accepted this 1st day of June A. D. 1901, at Denver, State of Colorado.

JAMES B. ORMAN,
Governor of the State of Colorado.

THE UNITED STATES OF AMERICA, *ss:*

The President of the United States of America to the State of Colorado, Greeting:

[SEAL.] For certain causes offered before the Supreme Court of the United States, having jurisdiction in equity, you are hereby commanded, that laying all other matters aside and notwithstanding any excuse, you be and appear before the said Supreme Court holding jurisdiction in equity, on Monday, the 14th day of October, 1901, at the city of Washington, in the District of Columbia, being the seat of the National Government of the United States, to answer unto the bill of complaint of the State of Kansas in the said court exhibited against you.

Hereof you are not to fail at your peril.

Witness the Honorable Melville W. Fuller, Chief Justice of the United States, at the city of Washington, the 23d day of May, A. D. 1901.

(Signed) JAMES H. McKENNEY,
Clerk of the Supreme Court of the United States.

STATE OF COLORADO, *ss:*

Service of the process of which the above is a copy, is hereby accepted this 1st day of June A. D. 1901 at Denver, State of Colorado.

CHARLES C. POST,
Attorney General of the State of Colorado.

Endorsed: Supreme Court, U. S. October term, 1901. No. 10, original The State of Kansas, complainant, vs. The State of Colorado. Subpœna and acceptance of service of same by governor and attorney general of Colorado. Filed June 4, 1901.

And afterwards, to wit, on the 15th day of October, A. D. 1901, the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1901.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO. } No. 10, Original.

On motion of Mr. F. D. McKenney, in behalf of counsel for the defendant, leave is hereby granted to file the demurrer of the defendant to the bill of complaint herein.
October 15th, 1901.

And on the same day, to wit, the 15th day of October, A. D. 1901, a demurrer was filed in the words and figures following, viz:

In the Supreme Court of the United States.

THE STATE OF KANSAS, Plaintiff,
vs.
THE STATE OF COLORADO, Defendant. } 10, Orig'l.

Demurrer to Bill.

Chas. C. Post, attorney general.
Luther M. Goddard, Charles S. Thomas, Platt Rogers, Henry A. Dubbs, of counsel.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Plaintiff,
vs.
THE STATE OF COLORADO, Defendant. }

The defendant, according to the statute in such case made and provided, states the following causes of demurrer to the said bill of complaint:

First. That this court has no jurisdiction of either the parties to or the subject matter of this suit because it appears on the face of said bill of complaint that the matters set forth therein do not constitute within the meaning of the Constitution of the United States, any controversy between the State of Kansas and the State of Colorado.

Second. Because the allegations of said bill show that the issues presented by said bill arise, if at all, between the State of Kansas and certain private corporations and certain persons in the State of Colorado who are not made parties herein and which matters so

stated, if true, do not concern the State of Colorado as a corporate body or State.

Third. Because said bill shows upon its face that this suit is in reality for and on behalf of certain individuals who reside in the said State of Kansas on the banks of the Arkansas river and that although the said suit is attempted to be prosecuted for and in the name of the State of Kansas said State is in fact loaning its name to said individuals and is only a nominal party to said suit and that the real parties in interest are the said private parties and persons residing in said State.

Fourth. Because it appears from the face of said bill that the State of Kansas in her right of sovereignty is seeking to maintain this suit for the redress of the supposed wrongs of certain private citizens of said State while under the Constitution of the United States and the laws enacted thereunder, said State possesses no such sovereignty as empowers it to bring an original suit in this court for such purposes.

Fifth. Because it appears upon the face of said bill of complaint that no property rights of the State of Kansas are in any manner affected by the matters alleged in said bill of complaint; nor is there any such property right involved in this suit as would give this court original jurisdiction of this cause.

Sixth. Because it appears from the face of said bill of complaint that the acts complained of are not done by the State of Colorado or under its authority, but by certain private corporations and individuals against whom relief is sought and who are not made parties herein.

Seventh. The bill is multifarious in this, to wit: That thereby the State of Kansas seeks to determine the claims of the State of Kansas as a riparian owner against the claims of the State of Colorado as an appropriator of water; the claims of the State of Kansas as a riparian owner against the separate and severable claims of numerous undisclosed Colorado appropriators of water; the separate and severable claims of various disclosed and undisclosed riparian claimants in Kansas against the claims of the State of Colorado as an appropriator of water; and the separate and severable claims of various disclosed and undisclosed riparian claimants in Kansas against the separate and severable claims of numerous undisclosed Colorado appropriators; and otherwise, as is apparent from the bill.

Eighth. Because the acts and injuries complained of consist of the exercise of rights and the appropriation of water upon the national domain in conformity with and by virtue of divers acts of Congress in relation thereto.

Ninth. Because the constitution of the State of Colorado declaring public property in the waters of its natural streams and sanctioning the right of appropriation was enacted pursuant to national authority and ratified thereby at the time of admission of the State into the Union.

Tenth. Said bill of complaint is in other respects uncertain, infor-

mal and insufficient and does not state facts sufficient to entitle the State of Kansas to the equitable relief prayed for.

CHAS. C. POST,
Attorney General of the State of Colorado.

L. M. GODDARD,
C. S. THOMAS.
PLATT ROGERS,
Of Counsel.

I certify that, in my opinion, the foregoing demurrer of The State of Colorado, defendant, to the bill of complaint of The State of Kansas, complainant, is well founded in law and proper to be filed in the above cause.

CHAS. C. POST,
Attorney General for the State of Colorado
and Solicitor for the Defendant.

[Endorsed:] Supreme Court U. S. October term, 1901. Term No. 10, orig'l. The State of Kansas, complainant, vs. The State of Colorado. Demurrer. Filed Oct. 15, 1901.

And afterwards, to wit, on the 21st day of October, A. D. 1901, the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1901.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO. } No. 10, Original.

On motion of Mr. A. A. Godard, of counsel for the complainant,
It is ordered by the court that leave be granted the defendant to file a printed brief herein on or before December 2d, to complainant to file a brief in reply on or before February 3d, and that the cause be assigned for argument on Monday, February 24th next.
October 21st, 1901.

And afterwards, to wit, on the 19th day of February, A. D. 1902, a motion was filed in the words and figures following, viz:

Supreme Court of the United States, October Term, 1901.

STATE OF KANSAS, Complainant,
vs.
STATE OF COLORADO, Defendant. } Original, No. 10.

Comes now the defendant, by Charles C. Post, attorney general, and respectfully moves this honorable court for an order extending

the time for argument beyond the limitation of two hours on both sides, and the number of arguments to three on each side, at the hearing of the demurrer to the bill of complaint heretofore filed and specially assigned for hearing on Monday, the 24th inst.

And the defendant assigns as reasons for said motion the following:

That the said bill has been filed by the said State of Kansas against this defendant to enjoin it from appropriating and using, or to authorize any person, association, or corporation to use, appropriate, or divert, any of the waters of the Arkansas river, or its tributaries, within the boundaries of the State, for purposes of irrigation, mining, or manufacturing, and to prohibit it from extending, prolonging, or renewing to any individual, corporation, or association the right to use, appropriate, or divert the said waters or any part thereof upon the termination of any such right now in existence and which may terminate by limitation.

That the said State of Kansas claims and insists that it has in its sovereign capacity the rights of a riparian proprietor in said river, which traverses both of said States in its course from its headwaters to the Mississippi river; and also asserts the right to protect by injunction alleged injuries to its citizens living along and in the valley of the said river and owning real estate therein.

That the said bill and alleged right of action attacks an established policy and industrial system of this defendant, and is a menace to vast property interests, and will, if sustained by this honorable court, serve as a precedent to the institution of similar actions for similar purposes by other States and Territories adjoining the State of Colorado and traversed by streams of running water common to them and to the said State of Colorado.

That divers individuals and corporations using, appropriating, and diverting water from the Arkansas river, under the laws and constitution of the State of Colorado, have employed counsel to represent this defendant with the attorney general in resisting the said bill, and who should be heard in support of the demurrer, if consistent with the rules and orderly procedure of this honorable court.

That many of the questions raised by the demurrer to the said bill are *res integra* and require a thorough and exhaustive consideration.

That the subject-matter of the bill and effect of a decision sustaining its legality and overruling the demurrer is of concededly great and far-reaching importance, and the amount of the property interests directly to be affected thereby is of great magnitude.

That the State of Kansas, by its bill, seeks to limit the sovereignty of the State of Colorado and subordinate its right to the use of the waters of natural streams within its borders to the alleged superior right of the State of Kansas and its citizens therein.

Wherefore the defendant respectfully prays that this honorable court may, for the reasons aforesaid, grant its said application.

CHAS. C. POST,
Attorney General, State of Colorado.

CHARLES S. THOMAS,
LUTHER M. GODDARD,
PLATT ROGERS,
HENRY A. DUBBS,
Of Counsel.

[Endorsed:] Supreme Court U. S. October term, 1901. Term No. 10, original. State of Kansas, complainant, vs. State of Colorado. Motion to enlarge time for argument and that three counsel be allowed to argue on each side. Filed February 19, 1902.

And afterwards, to wit, on the 24th day of February, A. D. 1902, the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1901.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO.
} No. 10, Original.

On motion of Mr. Charles S. Thomas, of counsel for the defendant,
It is ordered by the court that three hours be allowed counsel on each side in the argument of this cause and that three counsel be allowed to be heard for the defendant.
February 24th, 1902.

And on the same day, to wit, on the 24th day of February A. D. 1902, an appearance for defendant was filed in words and figures following, viz:

Order for Appearance.

Supreme Court of the United States, October Term, 1901.

THE STATE OF KANSAS, Compl't,
vs.
THE STATE OF COLORADO.
} No. 10, Or'g'l.

The clerk will enter our appearance as counsel for the defendant.

CHAS. C. POST, Att'y General.
L. M. GODDARD,
CHAS. S. THOMAS, Att'ys for Def'ts, and
PLATT ROGERS & H. A. DUBBS,
Of Counsel.

☞ NOTE:—Must be signed by a member of the bar of the Supreme Court United States. Indivdual and not firm names must be signed.

[Endorsed:] Supreme Court U. S., October term, 1901. Term No. 10, Origil. Appearance for def't. Filed Feb. 24, 1902.

And on the same day, to wit, on the 24th day of February, A. D. 1902, the following entry appears of record, viz:

In the Supreme Court of the United States, October Term, 1901.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO. } No. 10, Original.

The argument of the demurrer herein was commenced by Mr. Luther R. Goddard, of counsel for the defendant, and continued by Mr. Platt Rogers of counsel for the defendant and Mr. A. A. Godard, of counsel for the complainant.
February 24th, 1902.

And afterwards, to wit, on the 25th day of February, A. D. 1902, the following entry appears of record, viz.

In the Supreme Court of the United States, October Term, 1901.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO. } No. 10, Original.

The argument of the demurrer herein was continued by Mr. A. A. Godard, and Mr. E. F. Ware, of counsel for the complainant, and concluded by Mr. Charles S. Thomas, of counsel for the defendant. Leave was granted counsel for the complainant to file an additional brief within seven days and to counsel for the defendant to file a reply thereto.
February 25th, 1902.

And afterwards, to wit, on the 7th day of April, A. D. 1902, the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1901.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO. } No. 10, Original.

This cause came on to be heard on the bill of complaint and demurrer of the defendant thereto, and was argued by counsel. On consideration whereof,

It is now here ordered, adjudged and decreed by this court that said demurrer be, and the same is hereby, overruled without prejudice to any question, and leave is hereby granted to said defendant to answer.

April 7th, 1902.

(Mr. Justice Gray did not hear the argument and took no part in this decision.)

And on the same day, to wit, the 7th day of April, A. D. 1902, an opinion on demurrer was filed in the words and figures following, viz:

Supreme Court of the United States, October Term, 1901.

THE STATE OF KANSAS, Complainant, vs. THE STATE OF COLORADO. } No. 10, Original. Bill in Equity.

(April 7, 1902.)

The State of Kansas, by leave of court, filed her bill of complaint against the State of Colorado on May 20, 1901, which, after stating that Kansas was admitted into the Union, January 29, 1861, and Colorado, August 1, 1876, averred:

That the Arkansas river rises in the Rocky mountains in the State of Colorado and flows through certain counties of that State and thence across the line into the State of Kansas; its tributaries in Colorado have their rise and entire flow in that State; the length of the river therein is approximately two hundred and eighty miles, and the drainage area of the river and its tributaries approximately twenty-two thousand square miles. All of the drainage area is east of the summit of the Rocky mountains and a large portion thereof in the mountains, where the accumulation of snow in the winter season is very great, the waters from the melting of which flow into the river directly and in great volume from early spring until August in each year. The river, after leaving the mountains of Colorado, proceeds in an easterly course for approximately two hundred miles to the west line of Kansas, and "is a navigable stream under the laws and departmental rules and regulations of the United States." The volume of water in the bed of the river flowing from Colorado into Kansas formerly was and should now be, and would be, very large, but for the wrongful diversion of the same; said volume at its normal height in the river at the mean average flow for about ten months in the year being upwards of two thousand cubic feet per second, while it is much less for about two months in the autumn in each year. The tributaries of the river in Kansas are comparatively few in number, and cannot furnish water to cause

a continuous stream to flow in the bed of the river, except near the south line of the State, where the river passes into the Territory of Oklahoma. The river after entering Kansas proceeds through certain enumerated counties thereof, and then through the Territory of Oklahoma, the Indian Territory and the State of Arkansas, and empties into the Mississippi river at the eastern boundary of that State. From Fort Gibson, in the Indian Territory, to the mouth of the river it is a large navigable stream, and is used for the purposes of trade and commerce by vessels plying thereon.

The length of the river in Kansas is about three hundred and ten miles; its course is through a broad valley, and along its entire length in Kansas are alluvial deposits of great depth, amounting in the aggregate to about two millions five hundred thousand acres, the greater part of which acreage and the greater part of the course of the river lying in the western part of the State. The elevation of the bed of the river through the State of Kansas is from three thousand three hundred and fifty feet above the level of the sea at the Colorado line to one thousand feet above that level at the point where it enters Oklahoma. The rainfall in the drainage area in the western half of the State of Kansas is very light, and, by reason of the porous nature of the soil throughout that area the greater portion of the water so falling sinks into the earth, and but a small portion thereof finds its way to the river except in the event of severe and unusual storms. The ordinary and useful rainfall in the major portion of the valley of the river in Kansas is utterly inadequate to the growing and maturing of cultivated crops of any kind, because the precipitatian is very scanty, and does not fall during the growing season of the year.

The river in its entire course through the State of Kansas has a natural fall of about seven and three-tenths feet per mile. Its valley is composed of sand covered with alluvial soil, and the river and the surface soil of the bottom lands in Kansas are all underlaid with sand and gravel, through which the waters of the river have flowed from time immemorial, extending in width under the entire valley for its whole length throughout the State, the natural course and flow of the river being in and beneath the bed thereof and beneath the surface of the bottom lands of the entire valley of the river, that portion which flows beneath the surface being called the "underflow." The "underflow" is confined to and is co-extensive with the valley, and varies in volume with the amount of water in discharge in the river. The water which flows in the river from Colorado into Kansas furnishes the principal and almost the entire supply of water for the underflow of the valley, and at its normal height the underflow is of great and lasting benefit to the bottom lands, both as to those which abut on the river and as to those which do not; and is of great benefit to the people owning and occupying such lands, "for that it furnishes moisture sufficient to grow ordinary farming crops in the absence of rainfall, and furnishes water at a moderate depth below the surface for domestic use and for the watering of

animals. The flow of the water in the riverbed is also of great value to the people in the vicinity by reason of the fact that the evaporation therefrom tends to cool and moisten the surrounding atmosphere, thereby greatly promoting the growth of all vegetation, enhancing the value of the lands in that vicinity, and conducing directly and materially to the public health and making the locality habitable. Owing to the dryness of the climate, the cloudlessness of the sky, the high elevation, and the prevailing winds, evaporation is rapid and great, being about sixty inches per annum at the east end of the river valley in Kansas, and ninety inches at the west line of the State. Outside of the valley in the western half of the State of Kansas are several million acres of arid upland and plateau upon which grows a sparse but valuable grass upon which cattle may feed, and upon which they have, in times past, in vast numbers, been fed and fattened, but the cattle so fed must have watering places and such watering places must be in the river valley. And the availability and use of said arid lands and the prosperity of the business of cattle feeding thereon depends entirely upon the water, its convenience, depth and supply, and if the surface flow of water in the bed of said river be wholly cut off from the State of Kansas, then the underflow will gradually diminish and run out, and the valley of the Arkansas river will become as arid and uninhabitable as is the upland and plateau along its course, since without said underflow the valley land will be unfit for cultivation, and the arid lands unavailable for grazing."

The bottom lands in the valley of the Arkansas river in Kansas "are practically level and rise from six to fifteen feet above the water bed of the river," and are such as are ordinarily termed "bottom lands." Nearly all of the bottom lands, including those which are adjacent to the bed of the river, are fertile and productive, valuable for farming purposes, and well adapted to the growing of corn, wheat, alfalfa, rye, &c., and "all like crops, grains and grasses usually grown in that latitude of the United States. In addition thereto, all of said lands are valuable for grazing purposes and well adapted to the support of vast numbers of cattle, horses, sheep and hogs."

More than three-fourths of these Kansas bottom lands were and are occupied by persons owning or leasing them, and residing thereon with their families; and more than two-fifths, including more than two-fifths of those on the river bank are and have been for years in actual cultivation, with an agricultural population of more than fifty thousand, raising all products "common to the latitude and climate," while numerous cities, towns and villages are situated on the bank of the river, including ten county seats, with an aggregate population of over fifty thousand. The actual value of the Arkansas bottom lands averages not less than twenty-five dollars an acre, provided they receive the benefits arising from the natural and normal flow of the water of the river, but that by reason of the wrongful acts of the State of Colorado the value of the

lands "has shrunk many millions of dollars, which has been a direct loss to the citizens of the State of Kansas, and to the taxable wealth, and to the revenues of the State of Kansas, and to the school system of the State as hereinafter set forth."

The bill further averred that all of the bottom lands were originally part of the public domain of the United States, and that the State became entitled, on admission, for school purposes, to sections sixteen and thirty-six of each township, some of which sections were situated within the valley, and a number of them adjoined the bed of the stream. That under the act of Congress of March 3, 1863, there was granted to the State practically all of the odd-numbered sections of land in the valley lying north of a line four miles south of the north line of township twenty-six, and the grant included all the territory of the Arkansas valley west of Wichita, being four-fifths of the valley; that all the requirements of the act of Congress were complied with prior to 1874 by the State and by the Atchison, Topeka and Santa Fe Railroad Company, and the title in fee simple had been conveyed to the State and by the State to the railroad company and others, being not less than nine hundred thousand acres, a large portion of which abutted upon the river; that the even-numbered sections had been at all times subject to entry and have been taken and occupied by settlers under the land laws.

Prior to the admission of Kansas there were many settlers and residents in the valley, occupying and holding lands there, more particularly along the line of the Santa Fe trail, which followed the river from the present site of the city of Hutchinson to the west line of the State, and during the — 1899, 1870 and 1871, the entire Arkansas valley, from the south line of the State to the city of Great Bend, was taken and occupied by actual settlers, who subsequently acquired title to the lands under the United States, the State, and the railroad company; while the other valley lands from Great Bend to the west line of Kansas were taken up between 1872 and 1884, and have been since occupied by settlers and purchasers from the State and company. All of the lands of the valley have been thus occupied, held and owned by the original settlers and their grantees, who have continuously held and owned all riparian and other rights in any way appertaining or belonging to the lands.

The bill further averred that under an act of Congress of March 2, 1889, certain lots were transferred to the State of Kansas, and had been since used for the maintenance of a soldiers' home thereon, in accordance with the provisions of the act; that these lands consisted of one hundred and twenty-six and fifty-six one-hundredths acres of bottom lands of the valley, adjoining and abutting on the bed of the river, and were fertile and well adapted to the raising of fruits, grains and vegetables when supplied with moisture, but that the value thereof depended entirely on the flow of water in the bed of the river and on the under flow beneath the land. That the

State was and had been during its entire ownership of the tract using a large portion of the same for raising grains, fruits, vegetables and grasses thereon for the needs of the institution, and as the owner was and had been since 1889 "entitled to the full, free and natural flow of all waters which naturally would flow in said river and beneath said land; and the rights of the State thereto are prior and superior to any right or claim of the State of Colorado accruing, acquired or established subsequent to said date."

It was also alleged that since 1885 the State of Kansas had been the owner of six hundred and forty acres situated in Reno county, on which it had erected a large institution for the purpose of an industrial reformatory, and that the greater portion of the lands were used for farming purposes in connection with the institution, and the production of grain, vegetables, &c., for its needs; that the lands are bottom lands in the valley of the Arkansas, furnished with moisture sufficient for the growing of crops thereon solely from the underflow of the river, the rainfall in ordinary seasons being entirely inadequate; and that the title of the State's grantors dated from 1873. And "by reason of the foregoing, the State of Kansas is entitled to the full natural flow of the water of the Arkansas river in its accustomed place and at its normal height and in its natural volume underneath all of the said reformatory lands. The rights of the State thereto relate back to May 19, 1873, and are prior and superior to any right or claim of the State of Colorado accruing, acquired or established subsequent to said date."

The bill further averred that the constitution of the State of Colorado provided in sections five and six of article fifteen as follows:

"SEC. 5. The water of every natural stream not heretofore appropriated within the State of Colorado is hereby declared to be the property of the public, and the same is dedicated to the uses of the people of the State subject to appropriation as hereinafter provided.

"SEC. 6. The right to divert unappropriated waters of any natural stream for beneficial uses shall never be denied. Priority of appropriation shall give the better right as between those using the water for the same purposes; but when the waters of any natural stream are not sufficient for the service of all, those using the water for domestic purposes shall have the preference over those claiming for any other purpose, and those using the water for agricultural purposes shall have the preference over those using the same for manufacturing purposes."

That the legislature of Colorado has from time to time passed numerous laws purporting to authorize the diversion of water from the Arkansas river and its tributaries, in that State, for uses and purposes other than domestic; "more particularly for the purpose of irrigating arid and waste lands for agricultural purposes in said State." That in and by its laws and through its officers and courts Colorado has assumed "to grant to divers persons, firms and corporations the right and authority to divert the waters of the Arkansas river and its tributaries in Colorado from their natural channels,

and to cause said waters to flow into and through canals and ditches constructed for the purpose, extending great distances away from the natural channels of said streams, and to store said waters and to empty the same upon high arid lands, not riparian to said streams, where large portions of such waters are lost from evaporation, and the remainder sinks into the earth, as a result of which, all of said waters are forever lost to such streams and are thus and thereby prevented from flowing into or through the State of Kansas."

That in pursuance of the constitutional provisions and statutes of Colorado, many persons, firms and corporations claim to have acquired rights to divert water from the river and its tributaries for the purpose of irrigating arid, non-riparian lands in that State, each of them owning one or more ditches or canals, some being of great capacity and many miles in length. And many of these persons, firms and corporations "have constructed great reservoirs within which to store, and in which are stored for use, vast quantities of the water of said streams before using it for the purpose of irrigation."

That these ditch owners and the State of Colorado are now diverting the waters flowing in the bed of the Arkansas river and its tributaries, and carrying them to great distances from their natural courses, and discharging them for agricultural purposes on "arid and non-riparian lands, where such waters are wholly lost to such streams and to the State of Kansas and its inhabitants. That such diversion is carried to such an extent that no water flows in the bed of said river from the State of Colorado into the State of Kansas during the annual growing season, and the underflow of said river in Kansas is diminishing and continuing to diminish, and if the said diversion continues to increase, the bottom lands of said valley will be injured to an enormous extent, and a large portion thereof will be utterly ruined and will become deserted and be a part of an arid desert."

That the State of Colorado, through its laws, legislatures, officers and agents, assumes to authorize canal and ditch owners to take, carry away, and so use the waters of the streams, and to regulate and control the distribution thereof to land owners for irrigation purposes; that other canals and ditches for the irrigation of arid, non-riparian lands are contemplated, and the extension of branches and laterals; that this system is being continuously carried on in the drainage area of the Arkansas valley, and that unless restrained therefrom Colorado will grant additional rights for the construction of other canals and ditches sufficient to divert all the water in the river so that none will flow into Kansas.

That Colorado has since 1890 constructed and owns and manages a great canal for diverting water of the Arkansas river from its channel, and using it on arid, non-riparian lands, so that it will not return to or again flow in the river; and the State permits its agents to divert into said canal water to the amount of seven hundred and fifty-six and twenty-eight one hundredths cubic feet per second,

which is approximately the natural flow of the river at the place of the diversion.

That the water so diverted is sold by the State of Colorado to persons owning lands in the vicinity and is used by such owners in irrigating arid, non-riparian lands, when but for the diversion it would flow into Kansas and through said valley.

That the State of Colorado is threatening to build, and will build unless restrained, other similar canals with the intention of diverting other large quantities of water from the river, and irrigating other arid, non-riparian lands, and the legislature of that State has authorized their construction; and the State of Colorado also intends to and will unless restrained, extend its existing canal and build branches and laterals.

That Colorado has by legislation appropriated large sums of money for the construction of reservoirs for the storage of water from the streams tributary to the Arkansas river, and provided for the control thereof, and the sale of the waters so stored for the irrigation of arid lands, non-riparian to the streams from which the waters are takon. That the State has constructed and is using four of such reservoirs holding vast quantities of water which would otherwise flow into the State of Kansas; and by reason of the use of those waters no portion thereof is permitted to return to its natural channel or flow in the river. That the State of Colorado is now preparing to construct and intends to construct, and unless restrained, will construct, at various points along the river and its tributaries, vast reservoirs in which to further store and hold the natural and flood waters of said stream; "and it is the intention and expectation of said State so to store and withhold and divert from the channel of said river all of the water thereof." That surveys for these reservoirs had been made and plans and specifications were being prepared for their construction, and the State is preparing to enter on the construction thereof. That if these reservoirs are so constructed by Colorado vast and enormous quantities of water which would otherwise flow into the State of Kansas will be taken and held and sold and used for the irrigation of arid and non-riparian lands, not now irrigated, and will be forever lost to the river and the State of Kansas, which will cause in Kansas in said valley a vast and ruinous decline in agriculture, and great diminution of the wealth and revenues of the State, and in its population and prosperity.

Complainant charged the facts to be "that it is the intention of the State of Colorado to divert absolutely all of the water that does, can or might flow down the Arkansas river into the State of Kansas, so that all of the water shall be used in the State of Colorado, and none whatever, either above or below the surface, that may by any possibility, be utilized, shall cross the line into the State of Kansas, all to the great profit and advantage of the State of Colorado; and to the great damage and injury of the State of Kansas."

It was further stated that when the Territory of Kansas was or-

ganized in 1854 it extended from its present eastern boundary to the summit of the Rocky mountains, and all of the present drainage area of the Arkansas river in Colorado was then included therein, and during all of the period from then to the organization of the State of Kansas, the water of the river was wholly unappropriated, and the common law and the riparian rights herein claimed extended over the whole of the Arkansas valley and to the summits of the Rocky mountains, and had for many years prior thereto. That by reason of the prior settlement, occupation and title of the inhabitants of Kansas upon and to the lands situated in the valley of said river, including those upon its banks, Kansas and the owners of land in the valley acquired, and now have the right to the uninterrupted and unimpeded flow of all the waters of the river into and across the State of Kansas; which rights accrued prior to any of the diversions by or in Colorado, and prior to the accruing of any of the rights claimed by that State, or by persons, firms or corporations therein now taking water from the river or its tributaries.

The bill further averred that the State of Colorado and the various persons, firms and corporations engaged in taking waters from the river and its tributaries under and in pursuance of authority granted by the State of Colorado, have by so doing wrongfully, illegally and unlawfully diverted the water from the accustomed channel across the State of Kansas, and have greatly damaged and irreparably injured the State of Kansas, and its inhabitants. That by reason of such diversion the fertility of all the valley lands in Kansas, including those on the river banks as well as others, has been greatly diminished, and the crops, trees and vegetation have languished and declined, and in many places perished, and wells which should furnish water for domestic use and animals have become dry. That these damages are the proximate and necessary result of the diversion of the waters, and that such damage amounts to vast sums annually, which damages have increased year by year for the past ten years, substantially in proportion as the diversion of the waters in the State of Colorado has increased.

It was also stated that by reason of the diversion of the waters as described, during the summer season and dry portion of the year, the bed of the river in Kansas above the city of Wichita becomes practically, and oftentimes wholly dry, and because of the natural features of the territory through which the stream passes, which are set forth, the channel becomes filled up and great damage is inflicted at times of sudden and excessive rainfall in Kansas or sudden and excessive melting of snows in Colorado.

That the property of complainant, situated on the banks of the river and used for the purposes of a soldiers' home, has been greatly damaged and specially injured by reason of the diversion of the water, which would otherwise flow by and underneath the said tract of land, and unless the natural and normal flow is restored the value of the property will be entirely destroyed. And that the

same is true of complainant's property used for the purposes of a State industrial reformatory.

The bill further averred that a large number of irrigation canals and ditches, now wrongfully used in diverting the waters of the Arkansas river and its tributaries from their accustomed channels in Colorado, are owned and operated by domestic corporations organized for that purpose under the laws of Colorado, with limited periods of existence, and that if Colorado be not restrained from doing so, she will grant extensions of the charters now held, and also grant other and new charters to corporations organized for the purpose of unlawfully and wrongfully diverting and using said waters for irrigation purposes, all to the irreparable injury of the State of Kansas and its inhabitants.

The bill then prayed "that a decree may be entered prohibiting, enjoining and restraining the State of Colorado from granting, issuing, or permitting to be granted or issued hereafter, any charter, license, permit or authority to any person, firm or corporation for the diversion of any of the waters of the Arkansas river or of any of its tributaries from their natural beds, courses and channels within the State of Colorado, except for domestic use; and from granting to any person, firm or corporation any right to extend or enlarge any of the canals or ditches, now existing; or to construct and operate any other canals, ditches, branches, laterals or reservoirs in addition to those heretofore constructed and now in use in said State."

"That the said State of Colorado may be prohibited, enjoined, and restrained, as a State, from itself constructing, owning, or operating, either directly or indirectly, any canal or ditch whereby the waters of said river, or any of its tributaries, shall be diverted from their natural courses and channels; and from constructing, owning, operating or using any reservoir for the storage of the waters of said river, or any of its tributaries, for purposes of irrigation."

"That the said State of Colorado may be prohibited, enjoined and restrained from granting to any person, firm or corporation any extension of any charter, license, permit, or authority, of any kind or nature whatsoever, for the diversion of any of said waters from said river or its tributaries for irrigation purposes or for the continuance of such diversion thereof after the charter, license, permit or authority theretofore granted for that purpose shall have expired."

And for general relief.

Thereupon, October 15, 1901, the State of Colorado, by leave, filed its demurrer to the bill of complaint, assigning the following causes:

"First. That this court has no jurisdiction of either the parties to or the subject matter of this suit because it appears on the face of said bill of complaint that the matters set forth therein do not constitute, within the meaning of the Constitution of the United

States, any controversy between the State of Kansas and the State of Colorado.

"Second. Because the allegations of said bill show that the issues presented by said bill arise, if at all, between the State of Kansas and certain private corporations and certain persons in the State of Colorado who are not made parties herein and which matters so stated, if true, do not concern the State of Colorado as a corporate body or State.

"Third. Because said bill shows upon its face that this suit is in reality for and on behalf of certain individuals who reside in the said State of Kansas on the banks of the Arkansas river, and that although the said suit is attempted to be prosecuted for and in the name of the State of Kansas, said State is in fact loaning its name to said individuals and is only a nominal party to said suit and that the real parties in interest are the said private parties and persons residing in said State.

"Fourth. Because it appears from the face of said bill that the State of Kansas in her right of sovereignty is seeking to maintain this suit for the redress of the supposed wrongs of certain private citizens of said State while under the Constitution of the United States and the laws enacted thereunder, said State possesses no such sovereignty as empowers it to bring an original suit in this court for such purposes.

"Fifth. Because it appears upon the face of said bill of complaint that no property rights of the State of Kansas are in any manner affected by the matters alleged in said bill of complaint; nor is there any such property right involved in this suit as would give this court original jurisdiction of this cause.

"Sixth. Because it appears from the face of said bill of complaint that the acts complained of are not done by the State of Colorado or under its authority, but by certain private corporations and individuals against whom relief is sought and who are not made parties herein.

"Seventh. The bill is multifarious in this, to wit: that thereby the State of Kansas seeks to determine the claims of the State of Kansas as a riparian owner against the claims of the State of Colorado as an appropriator of water; the claims of the State of Kansas as a riparian owner against the separate and severable claims of numerous undisclosed Colorado appropriators of water; the separate and severable claims of various disclosed and undisclosed riparian claimants in Kansas against the claims of the State of Colorado as an appropriator of water; and the separate and severable claims of various disclosed and undisclosed riparian claimants in Kansas against the separate and severable claims of numerous undisclosed Colorado appropriators; and otherwise, as is apparent from the bill.

"Eighth. Because the acts and injuries complained of consist of the exercise of rights and the appropriation of water upon the na-

tional domain in conformity with and by virtue of divers acts of Congress in relation thereto.

"Ninth. Because the constitution of the State of Colorado declaring public property in the waters of its natural streams and sanctioning the right of appropriation was enacted pursuant to national authority and ratified thereby at the time of admission of the State into the Union.

"Tenth. Said bill of complaint is in other respects uncertain, informal and insufficient and does not state facts sufficient to entitle the State of Kansas to the equitable relief prayed for."

The demurrer was set down for argument, and duly argued February 24 and 25, 1902.

Mr. Chief Justice FULLER delivered the opinion of the court:

The original jurisdiction of this court over "controversies between two or more States" was declared by the judiciary act of 1789 to be exclusive, as in its nature it necessarily must be.

Reference to the language of the Constitution providing for its exercise, to its historical origin, to the decisions of this court in which the subject has received consideration, which was made at length in Missouri v. Illinois, 180 U. S., 208, demonstrates the comprehensiveness, the importance and the gravity of this grant of power, and the sagacious foresight of those by whom it was framed. By the first clause of section 10 of article I of the Constitution it was provided that "no State shall enter into any treaty, alliance or confederation;" and by the third clause that "no State shall, without the consent of Congress * * * keep troops or ships of war in time of peace, enter into any agreement or compact with another State, or with a foreign power, or engage in war, unless actually invaded, or in such imminent danger as will not admit of delay."

Treaties, alliances, and confederations were thus wholly prohibited, and Judge Tucker in his Appendix to Blackstone (vol. 1, p. 310) found the distinction between them and "agreements or compacts" mentioned in the third clause, in the fact that the former related "ordinarily to subjects of great national magnitude and importance, and are often perpetual, or made for a considerable period of time," but agreements or compacts concerned "transitory or local affairs, or such as cannot possibly affect any other interest but that of the parties." But Mr. Justice Story thought this an unsatisfactory exposition, and that the language of the first clause might be more plausibly interpreted "to apply to treaties of a political character, such as treaties of alliance for purposes of peace and war; and treaties of confederation, in which the parties are leagued for mutual government, political co-operation, and the exercise of political sovereignty; and treaties of cession of sovereignty, or conferring internal political jurisdiction, or external political dependence, or general commercial privileges; "while compacts and agreements might be very properly applied" to such as regarded what might be deemed mere private rights of sovereignty; such as questions of

boundaries; interests in land situate in the territory of each other; and other internal regulations for the mutual comfort and convenience of States bordering on each other." 2 Story, Const. secs. 1402, 1403; Louisiana v. Texas, 176 U. S. 1.

Undoubtedly, as remarked by Mr. Justice Bradley in Hans v. Louisiana, 134 U. S., 1, 15, the Constitution made some things justiciable, "which were not known as such at the common law; such, for example, as controversies between States as to boundary lines, and other questions admitting of judicial solution." And as the remedies resorted to by independent States for the determination of controversies raised by collision between them were withdrawn from the States by the Constitution, a wide range of matters, susceptible of adjustment and not purely political in their nature, was made justiciable by that instrument.

In Missouri v. Illinois, and The Sanitary District of Chicago, 180 U, S., 208, it was alleged that an artificial channel or drain constructed by the sanitary district for purpose of sewerage under authority derived from the State of Illinois, created a continuing nuisance dangerous to the health of the people of the State of Missouri, and the bill charged that the acts of defendants, if not restrained, would result in poisoning the water supply of the inhabitants of Missouri, and in injuriously affecting that portion of the bed of the Mississippi river lying within its territory. In disposing of a demurrer to the bill, numerous cases involving the exercise of original jurisdiction by this court were examined, and the court, speaking through Mr. Justice Shiras said: "The cases cited show that such jurisdiction has been exercised in cases involving boundaries and jurisdiction over lands and their inhabitants, and in cases directly affecting the property rights and interests of a State. But such cases manifestly do not cover the entire field in which such controversies may arise, and for which the Constitution has provided a remedy; and it would be objectionable, and, indeed, impossible for the court to anticipate by definition what controversies can and what cannot be brought within the original jurisdiction of this court. An inspection of the bill discloses the nature of the injury complained of is such that an adequate remedy can only be found in this court at the suit of the State of Missouri. It is true that no question of boundary is involved, nor of direct property rights belonging to the complainant State, but it must surely be conceded that, if the health and comfort of the inhabitants of a State are threatened, the State is the proper party to represent and defend them. If Missouri were an independent and sovereign State all must admit that she could seek a remedy by negotiation, and, that failing, by force. Diplomatic powers and the right to make war having been surrendered to the General Government, it was to be expected that upon the latter would be devolved the duty of providing a remedy and that remedy, we think, is found in the constitutional provisions we are considering. The allegations of the bill plainly prevent such a case. The health and comfort of the large

communities inhabiting those parts of the State situated on the Mississippi river are not alone concerned, but contagious and typhoidal diseases introduced in the river communities may spread themselves throughout the territory of the State. Moreover substantial impairment of the health and prosperity of the towns and cities of the State situated on the Mississippi river, including its commercial metropolis, would injuriously affect the entire State. That suits brought by individuals, each for personal injuries, threatened or received, would be wholly inadequate and disproportionate remedies, requires no argument."

As will be perceived, the court there ruled that the mere fact that a State had no pecuniary interest in the controversy, would not defeat the original jurisdiction of this court, which might be invoked by the State as *parens patriæ*, trustee, guardian or representative of all or a considerable portion of its citizens; and that the threatened pollution of the waters of a river flowing between States, under the authority of one of them, thereby putting the health and comfort of the citizens of the other in jeopardy, presented a cause of action justifiable under the Constitution.

In the case before us, the State of Kansas files her bill as representing and on behalf of her citizens, as well as in vindication of her alleged rights as an individual owner, and seeks relief in respect of being deprived of the waters of the river accustomed to flow through and across the State, and the consequent destruction of the property of herself and of her citizens and injury to their health and comfort. The action complained of is State action and not the action of State officers in abuse or excess of their powers.

The State of Colorado contends that, as a sovereign and independent State, she is justified, if her geographical situation and material welfare demand it in her judgment, in consuming for beneficial purposes all the waters within her boundaries; and that as the sources of the Arkansas river are in Colorado, she may absolutely and wholly deprive Kansas and her citizens of any use of or share in the waters of that river. She says that she occupies toward the State of Kansas the same position that foreign States occupy toward each other, although she admits that the Constitution does not contemplate that controversies between members of the United States may be settled by reprisal or force of arms, and that to secure the orderly adjustment of such differences, power was lodged in this court to hear and determine them. The rule of decision, however, it is contended, is the rule which controls foreign and independent States, in their relations to each other; that by the law of nations the primary and absolute right of a State is self-preservation; that the improvement of her revenues, arts, agriculture and commerce are incontrovertible rights of sovereignty; that she has dominion over all things within her territory, including all bodies of water, standing or running within her boundary lines; that the moral obligations of a State to observe the demands of comity cannot be made the subject of controversy between States; and that only those con-

troversies are justiciable in this court, which, prior to the *the* Union, would have been just cause for reprisal by the complaining State, and that, according to international law, reprisal can only be made when a positive wrong has been inflicted or rights *stricti juris* withheld.

But when one of our States complains of the infliction of such wrong or the deprivation of such rights by another State, how shall the existence of cause of complaint be ascertained, and be accommodated if well founded? The States of this Union cannot make war upon each other. They cannot "grant letters of marque and reprisal." They cannot make reprisal on each other by embargo. They cannot enter upon diplomatic relations and make treaties.

As Mr. Justice Baldwin remarked in Rhode Island v. Massachusetts, "Bound hand and foot by the prohibitions of the Constitution, a complaining State can neither treat, agree or fight with its adversary, without the consent of Congress; a resort to the judicial power is the only means left for legally adjusting, or persuading a State which has possession of disputed territory, to enter into an agreement or compact, relating to a controverted boundary. Few, if any, will be made, when it is left to the pleasure of the State in possession; but when it is known that some tribunal can decide on the right, it is most probable that controversies will be settled by compact." 12 Pet. 726.

"War," said Mr. Justice Johnson, "is a suit prosecuted by the sword; and where the question to be decided is one of original claim to territory, grants of soil made *flagrante bello* by the party that fails, can only derive validity from treaty stipulations." 12 Wheat. 528.

The publicists suggest as just causes of war, defense; recovery of one's own; and punishment of an enemy. But as between States of this Union, who can determine what would be a just cause of war?

Comity demanded that navigable rivers, should be free, and therefore the freedom of the Mississippi, the Rhine, the Scheldt, the Danube, the St. Lawrence, the Amazon, and other rivers has been at different times secured by treaty; but if a State of this Union deprives another State of its rights in a navigable stream, and Congress has not regulated the subject, as no treaty can be made between them, how is the matter to be adjusted?

Applying the principles settled in previous cases, we have no special difficulty with the bare question whether facts might not exist which would justify our interposition, while the manifest importance of the case and the necessity of the ascertainment of all the facts before the propositions of law can be satisfactorily dealt with, lead us to the conclusion that the cause should go to issue and proofs before final decision.

The pursuit of this course, on occasion, is thus referred to by Mr. Daniell, (p. 542): "The court sometimes declines to decide a doubtful question of title on demurrer; in which case, the demurrer will be overruled, without prejudice to any question. A demurrer may

also be overruled, with liberty to the defendant to insist upon the same defense by answer, if the allegations of the bill are such that the case ought not to bedecided without an answer being put in. * * * A demurrer will lie wherever it is clear that, taking the charges in the bill to be true, the bill would be dismissed at the hearing; but it must be founded on this: that it is an absolute, certain, and clear proposition that it would be so; for if it is a case of circumstances, in which a minute variation between them as stated by the bill, and those established by the evidence, may either incline the court to modify the relief or to grant no relief at all, the court, although it sees that the granting the modified relief at the hearing will be attended with considerable difficulty, will not support a demurrer."

Without subjecting the bill to minute criticism, we think its averments sufficient to present the question as to the power of one State of the Union to wholly deprive another of the benefit of water from a river rising in the former and, by nature, flowing into and through the latter, and that, therefore, this court, speaking broadly, has jurisdiction.

We do not pause to consider the scope of the relief which it might be possible to accord on such a bill. Doubtless the specific prayers of this bill are in many respects open to objection, but there is a prayer for general relief, and under that, such appropriate decree as the facts might be found to justify, could be entered, if consistent with the case made by the bill, and not inconsistent with the specific prayers in whole or in part, if that were also essential. Tayloe v. Insurance Company, 9 How., 390, 406; Daniell, Ch. Pr. (4th Am. ed.), 380.

Advancing from the preliminary inquiry, other propositions of law are urged as fatal to relief, most of which, perhaps all, are dependent on the actual facts. The general rule is that the truth of material and relevant matters, set forth with requisite precision, are admitted by demurrer, but in a case of this magnitude, involving questions of so grave and far-reaching importance, it does not seem to us wise to apply that rule, and we must decline to do so.

The gravamen of the bill is that the State of Colorado, acting directly herself, as well as through private persons thereto licensed, is depriving and threatening to deprive the State of Kansas and its inhabitants of all the water heretofore accustomed to flow in the Arkansas river through its channel on the surface, and through a subterranean course, across the State of Kansas; that this is threatened not only by the impounding, and the use of the water at the river's source, but as it flows after reaching the river. Injury, it is averred, is being, and would be, thereby inflicted on the State of Kansas as an individual owner and on all the inhabitants of the State, and especially on the inhabitants of that part of the State lying in the Arkansas valley. The injury is asserted to be threatened, and as being wrought, in respect of lands located on the banks of the river; lands lying on the lines of a subterranean flow; and lands lying some distance from the river either above or below ground, but de-

pendent on the river for a supply of water. And it is insisted that Colorado in doing this is violating the fundamental principle that one must use his own so as not to destroy the legal rights of another.

The State of Kansas appeals to the rule of the common law that owners of lands on the banks of a river are entitled to the continual flow of the stream, and while she concedes that this rule has been modified in the Western States, so that flowing water may be appropriated to mining purposes and for the reclamation of arid lands, and the doctrine of prior appropriation obtains, yet she says that that modification has not gone so far as to justify the destruction of the rights of other States and their inhabitants altogether; and that the acts of Congress of 1866 and subsequently, while recognizing the prior appropriation of water as in contravention of the common law rule as to a continuous flow, have not attempted to recognize it as rightful to that extent. In other words, Kansas contends that Colorado cannot absolutely destroy her rights and seeks some mode of accommodation as between them, while she further insists that she occupies for reasons given, the position of a prior appropriator herself, if put to that contention as between her and Colorado.

Sitting, as it were, as an international, as well as a domestic tribunal, we apply Federal law, State law, and international law, as the exigencies of the particular case may demand, and we are unwilling, in this case, to proceed on the mere technical admissions made by the demurrer. Nor do we regard it as necessary, whatever imperfections a close analysis of the pending bill may disclose, to compel its amendment at this stage of the litigation. We think proof should be made as to whether Colorado is herself actually threatening to wholly exhaust the flow of the Arkansas river in Kansas; whether what is described in the bill as the "underflow" is a subterranean stream flowing in a known and defined channel, and not merely water percolating through the strata below; whether certain persons, firms, and corporations in Colorado must be made parties hereto; what lands in Kansas are actually situated on the banks of the river, and what, either in Colorado or Kansas, are absolutely dependent on water therefrom; the extent of the watershed or the drainage area of the Arkansas river; the possibilities of the maintenance of a sustained flow through the control of flood waters; in short, the circumstances, a variation in which might induce the court to either grant, modify, or deny the relief sought or any part thereof.

The result is that in view of the intricate questions arising on the record, we are constrained to forbear proceeding until all the facts are before us on the evidence.

Demurrer overruled, without prejudice to any question, and leave to answer.

Mr. Justice Gray did not hear the argument, and took no part in the decision.

Endorsed: 10. Original. Kansas v. Colorado. Opinion on demurrer per Mr. Chief Justice Fuller. Filed April 7, 1902. Revise. Correct, J. H. McK. 1902. April 8.

And afterwards, to wit, on the 3d day of November, A. D. 1902, the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1902.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO. } No. 8, Original.

On motion of Mr. Frederic D. McKenney, in behalf of counsel, leave is hereby granted to file the answer of the defendant and a stipulation of counsel in relation thereto.
November 3d, 1902.

And on the same day, to-wit, on the 3d day of November A. D. 1902, a stipulation was filed in the words and figures following, viz:

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO, Defendant. } No. 8, Original.

It is hereby stipulated by and between the parties in the above entitled cause, that the defendant may have the time until the 1st day of November 1902 in which to file answer to the plaintiff's complaint; in the meantime the attorney general of Colorado is to furnish the attorney general of Kansas copies of such answer on or before the 25th day of October, 1902.
October 10th, 1902.

A. A. GODARD,
Attorney General of the State of Kansas.
CHAS. C. POST,
Attorney General of the State of Colorado.

Endorsed: Supreme Court of the United States. October term, 1902. No. 8, Original. State of Kansas, complainant, vs. State of Colorado, defendant. Stipulation as to filing answer. A. A. Godard, att'y-general of Kansas. Chas. C. Post, att'y-general of Colorado. Office Supreme Court U. S. Received Oct. 15, 1902.
Endorsed: Supreme Court U. S., October term, 1902. Term No. 8, original. The State of Kansas, complainant, vs. The State of Colorado. Stipulation as to filing answer. Filed Nov. 3", 1902.

And on the same day, to wit, on the 3d day of November, A. D. 1902, an answer was filed in the words and figures following, viz:

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO, Defendant. } Original Proceeding No. 8.

Answer of Defendant to Bill of Complaint.

Charles C. Post, attorney general of Colorado, solicitor for defendant.

Charles S. Thomas, Luther M. Goddard, Platt Rogers, Henry A. Dubbs, of counsel.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO, Defendant. } Original Proceeding No. 10.

The Answer of the State of Colorado, Defendant, to the Bill of Complaint of the State of Kansas, Complainant.

This defendant now and at all times hereafter, saving to itself all and all manner of benefit or advantage of exception or otherwise that can or may be had or taken to the many errors, uncertainties and imperfections in the said bill contained for answer thereto or to so much thereof as this defendant is advised it is material or necessary for it to make answer to, answering, saith:

First. This defendant admits that the rise, course, drainage area and general physical characteristics of the Arkansas river and of the valley thereof are as stated in the bill of complaint, but denies that the said river is in fact, or within the laws or departmental rules and regulations of the United States, a navigable stream either within the State of Colorado or the State of Kansas; and denies that any part of the course and flow of said river is beneath the surface of the bottom lands of the valley of said river or that the course and flow thereof is of any greater width than the channel of said river between its banks or that there is any underflow of water in the valley of said river passing from the State of Colorado into the State of Kansas, or that any diminution of the surface flow of said river will materially reduce or affect the water beneath the surface of the lands in said valley in the State of Kansas.

Second. This defendant denies that by reason of the acts complained of the value of the lands in the valley of the Arkansas, in the State of Kansas, has been diminished or the revenue of the State of Kansas arising therefrom, or which should or could arise therefrom, has been in any wise affected.

Third. This defendant has no knowledge of the several convey-

ances or grants of land in the valley of the Arkansas river, in the State of Kansas, heretofore made by the Government of the United States, but avers that as to all conveyances or grants referred to in said bill of complaint, the same were made subject to all rights to water from said river for irrigation purposes theretofore and thereafter to be acquired, and were taken with full knowledge upon the part of the State of Kansas, and of each and every grantee of said lands, that the waters of said river had been, were being and would be appropriated in the State of Colorado for beneficial uses in the irrigation of land, and that the lands in said valley in the State of Kansas, west of the 97th meridian, and in the State of Colorado, could only be made available for agricultural purposes by the like appropriation and use, and that the Government of the United States, as the primary owner of said lands, had assumed that it held the same subject to the appropriation of the waters of said river for irrigation purposes.

Fourth. This defendant denies that the legislature of the State of Colorado has passed laws authorizing or licensing the diversion of water from said Arkansas river, or has granted to any person, firm or corporation the right and authority to make such diversion, but on the contrary, avers that said legislature has at all times recognized the right to make such diversion as one existing independent of any action by it and as one founded on necessity and on the usages and customs of the arid region of the United States, existing prior to the adoption of the constitution of the State of Colorado and approved and confirmed by the statutes, decisions and rulings of the legislative, judicial and executive departments of the United States, and said legislature has never assumed the power to either grant or restrain the right to divert the waters of the Arkansas river for irrigation or other purposes, or to do more with respect to such diversions than to regulate and control the same by appropriate legislation.

Fifth. This defendant denies that, by the diversion of water from the said river in the State of Colorado, no water flows into the State of Kansas during the annual growing season, or that the underflow of said river in the State of Kansas is thereby diminished, or that, if diminished, the bottom lands of said river have become, or will become, injured, ruined or deserted.

Sixth. This defendant admits that a canal was commenced about the year 1890, near Canon City, under State control, but it avers that it was subsequently learned that the ordinary and usual flow of water in the Arkansas river during the irrigating season had theretofore been appropriated by the persons, firms and corporations mentioned in said bill of complaint, and that the construction thereof was thereupon abandoned, and that no water has at any time been diverted from said river into or through said canal by this defendant or at all, and that this defendant has not, at any place along said river, taken or diverted any of the water thereof that would otherwise have flowed into the State of Kansas as part of the usual

and ordinary flow of said river, and is not now so doing or intending so to do, nor to construct works whereby the same may be done.

Seventh. This defendant admits that certain reservoirs have been constructed with money appropriated by the legislature of the State of Colorado, in which to store the flood and storm waters of certain tributaries of said Arkansas river, which would otherwise overflow the banks of said tributaries, but said waters so stored have been discharged from said reservoirs into said tributaries during periods of low water for the purpose of equalizing the flow of water in said tributaries, so that the same might be used for irrigation purposes by private appropriators below; but this defendant has not stored, nor does it intend to store, the ordinary and usual flow of said river or its tributaries, nor to interfere, by storage in reservoirs, now or hereafter to be constructed, with the usual and ordinary flow of said river in the State of Kansas.

Eighth. This defendant denies that when the Territory of Kansas was created or the State of Kansas admitted to the Union, the water of said Arkansas river was wholly unappropriated, or that the common law and the riparian rights claimed in said bill of complaint extended over said valley in the State of Kansas, or that the owners of lands along said river were entitled to the unimpeded flow of the water of said river, but, on the contrary, avers that numerous appropriations of said water had been made for irrigation purposes long prior to the creation of said Territory, and many more were made prior the conveyance by the Government of the United States of any of the lands lying along or adjacent to said river, and that the necessity and right to divert the water of said river for the reclamation of arid land had, long previous to the creation of said Territory, been asserted and exercised by persons in possession of said land, and said necessity and right were thereafter recognized by the legislature of the Territory of Kansas, and all lands along said river acquired by the State of Kansas, or by individuals or corporations within the Territory or State of Kansas, were taken and held with knowledge of the necessity of diverting the water of said river for the purpose of claiming and making productive the lands along said river west of the 97th meridian, and that appropriations had been, were being, and would be made in that portion of the valley which is now within the jurisdiction of the State of Colorado, and that to the extent of said appropriations the flow of water of said river might, by the usages and customs then prevailing, be lawfully impeded.

Ninth. This defendant denies that, by the taking of water from said river in the State of Colorado in the manner alleged in said bill of complaint, the State of Kansas, or any of its citizens, or the owners of land along said river in the State of Kansas, have been injured in any degree whatever; or that the fertility of the lands, or the use thereof to the fullest extent to which the same is naturally capable of use, have been diminished or impaired; or that the crops,

trees and vegetation growing along said river have perished or will perish; or that the wells have become or will become dry; or that the salubrity or healthfulness of said valley, or of the lands adjacent to said river have been or will be impaired.

Tenth. This defendant denies that the right of domestic corporations to appropriate the water of said Arkansas river in the State of Colorado for purposes of irrigation is limited to the period of existence of such corporations, or that a renewal of the corporate existence is necessary to continue such right, but, on the contrary, avers that all appropriations of water, whether made by persons or corporations, are deemed and held to be in perpetuity.

This defendant for its first separate and further answer to the bill of complaint, says:

First. The several appropriations of the waters of the Arkansas river complained of in said bill of complaint were made in accordance with and in reliance upon the doctrine respecting the appropriation of the water of the natural streams for beneficial uses which, by usage and custom prevailed in the arid region of the United States at the time of said appropriations, and which, by the recognition and approval of the United States, has at all times been the law applicable to the public lands in said arid region.

Second. Prior to the acquisition of private title to any of the lands acquired by the General Government from France, Mexico and Texas by purchase, cession and annexation, respectively, comprising all the lands now within the jurisdiction of the United States between the Mississippi river and the Pacific coast, said General Government caused said lands to be explored and reported upon for the purpose of ascertaining the natural resources and the physical and climatic characteristics of the various portions thereof, and by said explorations and information obtained from time to time, it became known to the United States and the inhabitants thereof that from about the 97th meridian to the coast range of the Pacific slope, the land was an arid waste without timber or useful vegetation, except in the mountains, and that although the soil was rich and fertile, and great deposits of gold, silver and other valuable minerals existed therein, the soil could not be made productive nor the minerals extracted, nor could the land be inhabited, except by the diversion of water from the natural streams and the application thereof to agricultural and mining uses.

Third. With the earliest settlement in said arid region for agricultural and mining purposes, which was long prior to the opening of said lands to pre-emption and purchase, by necessity, common consent and uniform practice, the doctrine obtained that the waters of all the natural streams flowing through said arid region were subject to diversion and use for agricultural and mining purposes, and that the right to the water thus diverted could be obtained both as against the United States as the owner of the public lands and all grantees of the United States of lands lying along said streams, and that the right of the several appropriators from any given stream

should be in the order of diversion and use, the first in time being first in right, and said doctrine has at all times been and now is the customary law of said arid region in respect to the natural streams thereof.

Fourth. Upon the creation and admission of the several Territories and States of said arid region, including Kansas, both as a Territory and State, they recognized, approved and confirmed, and from thence hitherto have enforced said doctrine, and rights to water by diversion from the streams of said arid region have been maintained as against all claims of riparian rights.

Fifth. The Government of the United States, long prior to the sale by it of any of the public lands in the Arkansas valley, recognized and approved said doctrine, and applied the same to said public lands, and renounced all riparian rights which it might have asserted in contravention of said doctrine, and from thence hitherto has held and disposed of said lands subject to and in accordance with said doctrine, and has at all times encouraged and promoted the diversion and use of the water of the streams in said arid region for agricultural and mining purposes, and by grants of public money has aided in the construction of canals, ditches and reservoirs and other appliances for the diversion, storage and use of water, in the reclamation and cultivation of the public lands.

Sixth. By an act of Congress, approved September 4, 1841, and by subsequent acts relating thereto, the public lands, including the lands in said arid region were declared subject to pre-emption and purchase, and all persons desiring to avail themselves of the provisions of said act were required to make a settlement upon the land in person and to inhabit and improve the same. It was then, and at all times since has been well known to the General Government and particularly to Congress and the executive departments having in charge the administration of said acts, that the provisions thereof in respect to settlement, inhabitancy and improvement could not be complied with in the pre-emption and purchase of arid lands, except by the diversion of the waters of the streams upon the public lands and the application thereof to domestic and irrigation purposes in reliance upon the continuance of the right so to do in accordance with said doctrine of appropriation.

Seventh. By means of the diversion and use of the waters of said natural streams, many million acres of the public lands in said arid region have been settled upon, inhabited and improved and title thereto obtained from the General Government, in the belief that by its action and conduct in the disposition of its public lands, the United States had accepted and applied to said public lands the doctrine of appropriation as hereinbefore set forth; and there has been paid to said General Government, on account of said lands so improved by the diversion and use of water in accordance with said doctrine, upwards of twenty million dollars, and all of the lands in the valley of the Arkansas in the State of Colorado, save and except certain Indian lands, were settled upon and patents therefor

obtained by proof of the diversion and use of the waters of said Arkansas river in the reclamation and improvement of said lands, said diversions so made being those complained of and sought to be enjoined in and by the bill of complaint herein.

Eighth. The Territory of Kansas by its legislature, recognized and approved the said doctrine of appropriation, and in pursuance thereof in 1859 authorized the St. Charles Town Company to divert the waters of the South Platte river and Cherry creek, and the Mountain Company to divert the waters of the Platte river, and the El Paso Town Company to divert the waters of the tributaries of the Arkansas river heading at Pike's peak; and in 1860 authorized the Capital Hydraulic Company to divert for irrigating purposes all the waters of the South Platte river and Cherry creek. And the State of Kansas, by its legislature has also recognized, approved and adopted said doctrine; an act of said legislature enacted in 1868, authorizing corporations to construct canal diverting water for irrigating purposes; an act of the legislature enacted in 1886 providing that the running waters of the State might be appropriated for purposes of irrigation; an act of said legislature enacted in 1891, providing that in all that portion of the State west of the 99th meridian all natural waters, whether standing or running and whether surface or subterranean should be devoted first, to purposes of irrigation in aid of agriculture, subject to ordinary domestic uses; and, second, to other industrial purposes, and might be diverted from natural beds, basins or channels for such purposes and uses; and another act enacted in 1895 providing for the development of the land west of the 98th meridian by irrigation and regulating the distribution of water in the same manner as in Colorado. And in reliance upon the approval and adoption of said doctrine of appropriation by said State of Kansas, about five hundred miles of large canals and ditches have been constructed in Kansas, west of the 97th meridian at a cost ap-roximating one million dollars and thereby the waters of said Arkansas river have been appropriated and applied to about one hundred and fifty thousand acres of land in the valley of said river, in the State of Kansas.

Ninth. By the act of Congress approved January 29th, 1861, admitting Kansas into the Union, it was specifically provided that the State should never interfere with the primary disposal of the soil within the same by the United States, or with any regulations Congress might find necessary for securing the title in said soil to bona fide purchasers thereof, and that all laws of the United States not locally inapplicable should have the same force and effect within said State as in other States of the Union.

Tenth. Following the admission into the Union of the State of Kansas, said doctrine of appropriation was further recognized by Congress as the law applicable to the public lands and the natural streams thereof, including those in the State of Kansas, by the following acts:

An act approved July 26, 1866, by which it was provided that

whenever, by priority of possession, rights to the use of water for mining, manufacturing or other purposes, have accrued and are recognized according to local customs, laws and decisions, the owners and possessors shall be maintained and protected in their rights;

An act approved July 9, 1870, in which it was provided that all patents granted, or pre-emptions or homesteads allowed, should be subject to any vested and acquired water rights or rights to ditches and reservoirs used in connection with such water rights;

An act approved March 3, 1877, known as "the desert land act," which declared that all waters of all lakes, reservoirs and other sources of supply upon the public land should remain and be held free for the appropriation and use of the public for irrigation, mining and manufacturing purposes, and in and by which it was also provided that by the construction of canals and ditches and the application of said waters to the irrigation of the public lands, the title to said lands might thereby be obtained from the United States;

An act approved March 3, 1891, confirming the rights of way over the public lands in the arid region for canals and reservoirs for irrigation purposes;

An act approved August 18, 1894, providing for the conveyance to the several States in the arid region of such public lands as they might reclaim and irrigate;

An act approved June 17, 1902, authorizing and undertaking the construction of canals, ditches and reservoirs in the arid region, including therein the State of Colorado and the western portion of Kansas, whereby the waters of the public lands might be diverted and used for irrigation purposes, and appropriating for that purpose the proceeds of all moneys received from the sale of public lands in the States of Colorado and Kansas.

Under and by virtue of said act approved March 3, 1877, which was made applicable to lands in Colorado by an act approved March 3, 1891, several thousand acres of land in the Arkansas valley in the State of Colorado, were reclaimed and irrigated, and the diversions of water for said purposes are in part the diversions complained of in the said bill of complaint.

Eleventh. Said doctrine was further recognized by Congress by the appropriation, on October 2nd, 1888, of $229,000 for the purpose of investigating the extent to which the arid region of the United States might be redeemed by irrigation and for the segregation of the irrigable lands in such arid region, and for the selection of sites for reservoirs and other hydraulic works necessary for the storage and utilization of water for irrigation and also by a further appropriation made on March 2nd, 1889, of $450,000 for the like purpose, all of which moneys were expended in investigating and selecting reservoir sites and in running contour lines for the purpose of aiding and assisting those desiring to appropriate the waters of the natural streams and using the same for irrigating purposes.

Twelfth. The provisions of the constitution of the State of Colorado set forth and complained of in the bill of complaint, were

adopted in harmony with and in pursuance of the policy of the United States in respect to the diversion and use of water in the irrigation of land, and the same do not conflict with or contravene any act of Congress bearing upon said appropriation and use, but, on the contrary, are intended as a constitutional guaranty that the right to divert water for beneficial purposes as authorized and encouraged by the acts of Congress referred to shall never be denied, and said provisions were accepted and approved by the action of Congress in admitting Colorado into the Union, and the several acts of the legislature of Colorado, referred to in said bill of complaint, have been enacted for the purpose of protecting and regulating appropriations made in pursuance of the usages and customs prevailing in the arid region and the rights of appropriation as recognized and confirmed by the acts of Congress referred to.

Thirteenth. All grants and patents of land in the valley of the Arkansas, in the State of Kansas, were made by the United States, subject to the doctrine of appropriation heretofore set forth, and were accepted by the several grantees thereof with the knowledge that in the sale and disposition of the arid lands of the United States along said Arkansas river west of the 97th meridian, it had been and would be necessary to divert and use the waters of said river in the improvement and cultivation thereof, and said grants and patents of lands in the State of Kansas were made subject to the right of all persons desiring the use of the same for agricultural purposes to appropriate the waters of the Arkansas river, either in Kansas or Colorado, to the full extent of said river.

Fourteenth. And this defendant says that all further diversions of the waters of said Arkansas river, which by said bill of complaint it is sought to restrain, will be made by the General Government under and by virtue of said act of Congress, approved June 17, 1902.

This defendant, for a second separate and further answer to the bill of complaint, says:

First. Many of the appropriations of the waters of the Arkansas river, in the State of Colorado, complained of in said bill of complaint, *are* made prior to the creation of the Territory of Colorado and while said Arkansas valley was a part of the Territory of Kansas, and defendant is, therefore, unable to state the times at which said appropriations were made or the amount of water thus diverted from said river.

Second. Following the creation of the Territory of Colorado and prior to the year 1865, sixty-eight ditches and canals were constructed, and 615 cubic feet of water per second of time were thereby diverted from said river and its tributaries, and have at all times since been used in the irrigation of land in said Arkansas valley. From and including the year 1865 to the year 1870, 127 additional ditches and canals were constructed, and 458 cubic feet of water per second of time were thereby diverted from said river, and at all times since have been continuously used in the irrigation of lands in said valley. From and including the year 1870 to the year 1880

268 additional ditches and canals were constructed and 945 cubic feet of water per second of time thereby diverted, and at all times since used in the irrigation of land in said valley. From and including the year 1880 to the year 1890, 250 additional ditches and canals were constructed, and 3,859 cubic feet of water per second of time thereby diverted from said river, and at all times since continuously used when obtainable in the irrigation of land in said valley. All of said ditches and canals have been constructed by individuals and corporations, and the water, when obtainable, has been taken from said river and applied to the reclamation and irrigation of about five hundred thousand acres of land in said valley which, before said diversion and use, was arid and incapable of producing crops.

Third. In the construction of said canals and ditches and the reservoirs connected therewith, many million dollars have been expended, and in the lands irrigated by means of said ditches and canals, and in the improvements thereon and the machinery used in the cultivation thereof more than twenty-five million dollars have been invested. Numerous towns and villages have grown up in said valley in the State of Colorado, having as an aggregate population more than one hundred thousand, and houses, stores, churches, school houses, factories and public and private buildings for various purposes have been constructed for occupation and use, and actually used in connection with the continued settlement and cultivation of the lands in said valley by the use of the waters of said Arkansas river, the amount so invested aggregating many million dollars.

Fourth. In 1879 and 1881 the legislature of Colorado enacted certain statutes providing for the adjudication of rights to water by appropriation for agricultural uses from the streams in said State, under and by virtue of which irrigation districts were created along the entire length of the Arkansas river in said State, and proceedings were thereupon had in each of said districts in which the owners of ditches and canals taking water from said Arkansas river and its tributaries were parties, and in which the amount of water to which each ditch or canal was entitled was ascertained and decreed. In said proceedings the owners of 713 ditches and canals were parties, and decrees were entered finding the various amounts of water that had been appropriated from said river and its tributaries, and applied to beneficial uses in the irrigation of said lands in said valley, and the dates of said appropriations. In said adjudications many thousand dollars were expended in costs, attorney fees and other necessary expenses in the belief that by said decrees the right of each appropriator, in the order of his appropriation, to the waters of said river had been established as a perpetual property right.

Fifth. The State of Kansas and the inhabitants thereof, well knew that, commencing in said State at about the 97th meridian, and thence continuing westward to the Rocky mountains, the land was arid and incapable of being settled upon or cultivated, except by the diversion and use of the waters of the natural streams, and that

diversions of the waters of the Arkansas river were being made at the times and in the amounts and for the purpose hereinbefore set forth, and that such diversions were made under a claim of right to the continued use of the waters of said river as against all owners of land in the valley of the Arkansas throughout its entire length, and that the settlement of said valley in the State of Colorado and the expenditure of the amounts hereinbefore stated, and the construction of canals, ditches and reservoirs, and in lands, buildings and improvements, and in houses, stores, factories, and public and private buildings, was made in reliance upon the right to divert the waters of said river and to continue such diversion in perpetuity.

Sixth. Prior to the filing of the bill of complaint herein, neither the State of Kansas, nor the owners of lands in the Arkansas valley in said State, complained of said diversions, nor the right to make or continue the same, nor in any way or manner claimed or alleged any right upon the part of said State, or the owners of land in said valley, to the flow of said river as it had been accustomed to flow prior to the making of said appropriations; but, on the contrary, the said State approved the diversion of water from said river and affirmed the right to make the same in the reclamation and irrigation of the lands along said river, by an act of the legislature of said State, enacted in 1886, authorizing and providing for the like diversion and use of the waters of said river in the State of Kansas, and by a further act, enacted in 1891, declaring that in that portion of the State of Kansas west of the 99th meridian all natural waters, whether running or standing, and whether surface or subterranean, should be devoted, first, to the purposes of irrigation in aid of agriculture; and, second, to other industrial purposes, and that said waters might be diverted from natural beds and channels for such purposes and use, and the owners of land in said valley in said State recognized and approved said appropriations, and the right to continue the same, by themselves constructing about five hundred miles of canals and ditches, and diverting the waters of said river for the irrigation of about one hundred and fifty thousand acres of land, and claimed the right so to do as against all owners of lands along the course of said river in Kansas or elsewhere.

Seventh. The said State of Kansas and the owners of lands in the valley of the Arkansas, in said State, have at all times acquiesced in the appropriation of the waters of the Arkansas river in the State of Colorado, and have waived, surrendered and relinquished any and all riparian rights now claimed by them, and by their delay in the filing of the complaint herein have caused the several appropriators of water from said river in Colorado to make the expenditures hereinbefore mentioned, and the people in said valley to settle upon, improve and cultivate the lands, and to build towns and cities, and for that purpose to expend the sums hereinbefore mentioned; and they are now estopped, by their conduct and delay, from asserting or maintaining any of the rights claimed in the said bill of complaint.

Eighth. The claim of the State of Kansas to the flow of the water of said Arkansas river is not made in behalf of the owners of lands riparian to said river, nor for the purpose of causing said river to flow through said State for the use and benefit of the owners of said riparian lands, but is made and maintained for the sole purpose of securing the flow of the water of the said river in the State of Kansas, that the same may be diverted into the several ditches and canals above mentioned, and to such other ditches and canals as may be constructed in conformity with the statutes of said State, as hereinbefore set forth, to be used in the same manner as said waters are now used in the State of Colorado.

This defendant, for a third further and separate answer to the bill of complaint, says:

First. The Arkansas river leaves the foot hills of the Rocky mountains at an elevation of about six thousand feet above sea level, and thence flows eastward over an elevated plateau known as the "Great Plains" for several hundred miles, with a practically uniform descent to the east, passing into the State of Kansas at an elevation of 3,350 feet and into the Territory of Oklahoma at an elevation of 1,000 feet. Through Colorado and Kansas it has a broad, level bed of sand, seldom entirely covered with water, the ordinary flow running in thin sheets in tortuous and constantly changing channels in the river bed. From the mountains, for five hundred miles eastward, the watershed of said river is naturally barren, treeless and without any vegetation, except the short sparse grass common to the Great Plains. The annual precipitation of moisture is about fourteen inches, most of which falls in local and violent storms. In its uncultivated condition, the land rapidly sheds the rainfall, discharges it into the river and prevents the saturation of the soil and the formation of springs by which said river and the tributaries along its course might be fed. The tributary streams are usually dry, carrying and discharging water into the river only in case of storms. The sun is seldom obscured, and commencing near the State line between Colorado and Kansas, and continuing eastward for at least two hundred miles, the winds are dry and constant, in the summer season becoming so heated as to burn and destroy the vegetation and to absorb such water as may be in the bed of said river. The waters supplied to said river for about five hundred miles of its course after leaving the mountains are irregular in discharge and constantly varying in quantity, and are not sufficient to cause a steady and permanent flow during any season of the year. The main supply of the river is from the snows and storms in the mountains. As the snow melts only during warm days, this supply is also irregular and uncertain, and the volume of water in the river, therefore, changes daily and even hourly. Long before irrigation was practiced in Colorado, it was observed that as the waters from the mountains flowed eastward, the volume constantly diminished, and this diminution was the more marked as the river passed beyond the area of local storms caused by the mountains. During

the summer season, except when flooded by violent showers, the river, at a distance of from two hundred to four hundred miles from the mountains, would show no surface water other than occasional pools in the sand, and none of the water coming into said river in Colorado would flow to or across the lands in the central or humid portion of Kansas. The ordinary flow of said river in Kansas has been still further temporarily diminished by the destruction of timber on the water shed of said river in the mountains and by the extension westward of the cultivated area of lands in Kansas and by the sinking in western Kansas of upwards of one thousand wells contiguous to said river, and the pumping and use of the waters thus obtained upon the adjoining land.

Second. All of the canals, ditches and reservoirs in Colorado complained of in said bill of complaint have their headgates within one hundred and fifty miles of the mountains, and the waters diverted into said canals and ditches are the waters which, if not so diverted, would be lost by seepage and evaporation long before reaching the lands in Kansas claimed to be injured by such diversion.

Third. The waters of the Arkansas river diverted in Colorado are those which fall within the water shed of said river in said State, and they are diverted and used only upon such lands within said water shed as need the same for domestic and irrigation purposes, and all the said lands upon which said waters are used are lands entitled to the same as the riparian lands of said river.

This defendant, now having fully answered all the allegations in the plaintiff's bill of complaint, or so much thereof as the defendant is advised should be answered, asks to be hence dismissed with cost and charges in this behalf sustained.

CHAS. C. POST,
Attorney General of the State of Colorado
and Solicitor for Defendant.

CHARLES S. THOMAS,
LUTHER M. GODDARD,
PLATT ROGERS,
HENRY A. DUBBS.
Of Counsel.

[Endorsed :] Supreme Court U. S. October term, 1902. Term No. 8, orig'l. The State of Kansas, complainant vs. The State of Colorado Answer of defendant to bill of complaint Filed Nov. 3, 1902

And afterwards, to wit, on the 23d day of April, A. D. 1903, an appearance for defendant was filed in the words & figures following, viz:

Order for Appearance.

Supreme Court of the United States, October Term, 1902.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO. } No. 8, Orig'l.

The clerk will enter my appearance as counsel for the defendant.

NATHAN C. MILLER,
(P. O. Address.) Denver, Colorado.

☞NOTE.—Must be signed by a member of the bar of the Supreme Court United States. Individual and not firm names must be signed.

[Endorsed:] Supreme Court U. S. October term, 1902. Term No. 8, original. Appearance for def't. Filed April 23, 1903.

And afterwards, to wit, on the first day of May, A. D. 1903, an appearance for complainant was filed in the words and figures following, viz:

Order for Appearance.

Supreme Court of the United States, October Term, 1902.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO. } No. 8, Orig'l.

The clerk will enter my appearance as counsel for the complainant.

(Name.) C. C. COLEMAN,
(P. O. Address.) Topeka, Kans.

☞NOTE.—Must be signed by a member of the bar of the Supreme Court United States. Individual and not firm names must be signed.

[Endorsed:] Supreme Court U. S. October term, 1902. Term No. 8, orig'l. Appearance for comp't. Filed May 1, 1903.

And afterwards, to wit, on the 28th day of May, A. D. 1903, an appearance for the complainant was filed in the words and figures following, viz:

Order for Appearance.

Supreme Court of the United States, October Term, 1902.

THE STATE OF KANSAS, Compl't,
vs.
THE STATE OF COLORADO. } No. 8, Orig'l.

The clerk will enter my appearance as counsel for the complainant.

(Name.) N. H. LOOMIS,
(P. O. Address.) Topeka, Ks.

☞ NOTE.—Must be signed by a member of the bar of the Supreme Court United States. Individual and not firm names must be signed.

[Endorsed:] Supreme Court U. S. October term, 1902. Term No. 8, orig'l. Appearance for comp't. Filed May 28, 1903.

And afterwards, to wit, on the first day of June, A. D. 1903, a motion was filed in the words and figures following, viz:

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO, Defendant. } No. 8, Original.

Petition for Leave to Amend Bill of Complaint.

Now on this first day of June, 1903, in open court, comes the said complainant by C. C. Coleman, its attorney general and N. H. Loomis, of counsel, and respectfully moves and asks the court to grant leave to said complainant within a time to be fixed by the court to file a new and amended bill of complaint herein, and to make as additional defendants therein such persons and corporations as it may deem necessary, and that the court order subpœnas to issue to such new defendants commanding them to appear and answer herein to said bill of complaint and to fix the time for all pleadings and appearances herein as to all parties to said amended bill of complaint.

Wherefor- said complainant will ever pray &c.

THE STATE OF KANSAS,
Complainant,

By C. C. COLEMAN,
Attorney General.

N. H. LOOMIS,
Of Counsel.

Endorsed: Supreme Court, U. S., October term, 1902. Term No. 8, orig'l. The State of Kansas, complainant, vs. The State of Colorado. Motion for leave to amend bill of complaint. Filed June 1", 1903.

And on the same day, to wit, on the first day of June A. D. 1903, the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1902.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO. } No. 8, Original.

On motion of Mr. C. C. Coleman of counsel for the complainant, counsel for the defendant consenting thereto,

It is now here ordered by the court that leave be, and the same is hereby, granted to said complainant to file an amended bill of complaint herein on or before the 15th day of August next ensuing making additional parties defendant, and that subpœnas thereupon issue directed to said additional defendants commanding each of them to plead to said amended bill within sixty days after the service upon them respectively of said subpœnas, and the said State of Colorado is directed to plead to said amended bill on or before the 12th day of October, 1903.

June 1st, 1903.

And on the same day, to wit, on the first day of June, A. D. 1903, a stipulation was filed in the words and figures following, viz:

In the Supreme Court of the United States of America.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO, Defendant. } Original.

It is hereby stipulated by and between the State of Kansas, by C. C. Coleman, its attorney general and the State of Colorado, by N. C. Miller, its attorney general, that an order may be entered in the above entitled proceedings as follows:

In the Supreme Court of the United States of America.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO, Defendant. } Original.

On this first day of June, A. D. 1903, comes the State of Kansas by C. C. Coleman its attorney general, and the State of Colorado, by

N. C. Miller its attorney general, and thereupon the said State of Kansas presents its petition praying leave to amend its bill of complaint and to make divers persons and corporations parties defendant by said amended bill and the court having considered the said petition it is

Ordered, That on or before the 15th day of August next ensuing, the said State of Kansas file its amended bill of complaint and making as additional defendants such persons and corporations as it may deem necessary and that subpœnas thereupon issue directed to said additional defendants commanding each of them to plead to said bill within 60 days after the service upon them respectively of said subpœnas and the said State of Colorado is directed to plead to said amended bill on or before the first day of the October term, A. D. 1903, of this court.

And it is also ordered that if the State of Colorado shall answer said amended bill, the State of Kansas shall within 30 days after the filing of said answer plead thereto; and that to the several answers which may be filed by the said additional defendants the said State of Kansas shall plead within 60 days thereafter.

THE STATE OF KANSAS,
By C. C. COLEMAN,
Attorney General.

THE STATE OF COLORADO,
By N. C. MILLER,
Attorney General.

Endorsed: Supreme Court of United States. State of Kansas vs. State of Colorado. Stipulation and order.

Endorsed: Supreme Court, U. S., October term, 1902. Term No. 8, original. The State of Kansas, complainant, vs. The State of Colorado. Stipulation as to manner of pleading. Filed June 1, 1903.

And afterwards, to wit, on the 17th day of August, A. D. 1903, an amended bill was filed in the words and figures following, viz:

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL., Defendants. } No. 7, Orig'l.

Amended Bill in Equity.

C. C. Coleman, attorney general of the State of Kansas.
N. H. Loomis, F. Dumont Smith, S. S. Ashbaugh, of counsel.

In the Supreme Court of the United States.

To the honorable the Chief Justice and the associate justices of the Supreme Court of the United States:

Your orator, The State of Kansas, brings this its amended bill of complaint against The State of Colorado, and The Bessemer Ditch Company, a corporation; The Oxford Farmers' Ditch Company, a corporation; The Otero Canal Company, a corporation; The Lake Canal Company, a corporation; The Riverside Ditch Company, a corporation; The Catlin Consolidated Canal Company, a corporation; The Graham Ditch Company, a corporation; The Lamar Land and Canal Company, a corporation; The Amity Canal and Reservoir Company, a corporation; The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, a corporation; The Fort Lyon Canal Company, a corporation; The Colorado Land and Canal Company, a corporation; The Great Plains Water Company, a corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a corporation; The Colorado Fuel and Iron Company, a corporation; and The Bent-Otero Improvement Company, a corporation, and avers:

1. The State of Kansas is one of the United States of America, admitted into the Union January 29, 1861. The State of Colorado is one of the United States of America, admitted into the Union August 1, 1876. Each of the other parties defendant herein is a corporation organized, chartered and authorized to transact business under and by virtue of the laws of the State of Colorado, and owns, maintains and operates a ditch or ditches, canal or canals in the State of Colorado by and by means of which the waters of the Arkansas river and its tributaries are diverted and used as hereinafter set forth.

2. The original bill in these proceedings was exhibited and these proceedings instituted by direction of the Hon. W. E. Stanley, the duly elected, qualified and acting governor of the State of Kansas, and this amended bill is exhibited and these further proceedings prosecuted by direction of Hon. Willis J. Bailey, the present and duly elected, qualified and acting governor of said State of Kansas.

3. Your orator further says: The Arkansas river rises in the Rocky mountains, in the said State of Colorado, and flows from its source through the counties of Lake, Chaffee, Fremont, Pueblo, Otero, Bent, and Prowers, in said State, and thence from the last-named county across the line into the State of Kansas.

All tributaries entering the Arkansas river in the State of Colorado have their rise and entire flow in that State. The length of the river in the said State is, approximately, two hundred and eighty miles, and the drainage area of said river and its tributaries in the said State is, approximately, twenty-two thousand square miles. All of the drainage area of said river is east of the summit of the Rocky mountains, and a large portion of such area is in the mountains, where the fall of snow in the winter season is very great. Deep snows accumulate during the winter season in said mountains and the valleys thereof, which snow melting during the spring and summer, the waters therefrom flow into the river directly and in great volume from the early spring until the month of August in each year. The course of said river, after leaving the mountains of Colorado, proceeds in an easterly direction for, approximately, two hundred miles to the west line of the State of Kansas; and the river in its course, after leaving the mountains, is a navigable stream under the laws and departmental rules and regulations of the United States.

That the lands bordering upon the Arkansas river and its tributaries in the State of Colorado are of such a character that they are not saturated to an appreciable extent by the waters flowing in said river or its tributaries, and that said lands are arid and barren up to the very margin of said streams.

The volume of water in the bed of said river flowing from the State of Colorado into the State of Kansas formerly was, and should now be, and would be, very large but for the wrongful diversion of the same as hereinafter set forth, said volume at its normal height in said river at the mean average flow, at the State line, for about ten months in the year, being upwards of two thousand cubic feet per second. For a period of about two months in the autumn of each year the normal flow of water in the bed of said river shrinks and is much less than the amount above stated. The tributaries of said river in the State of Kansas are comparatively few in number, and do not and could not furnish water to cause a continuous stream to flow in the bed of the said river, except near the south line of the State, where the river flows into the Territory of Oklahoma.

The said river flowing from the State of Colorado enters the State of Kansas and proceeds through the counties of Hamilton, Kearny, Finney, Gray, Ford, Edwards, Pawnee, Barton, Rice, Sedgwick, Sumner, and Cowley, in the State of Kansas, and therefrom through the Territory of Oklahoma, the Indian Territory, and the State of Arkansas, and empties into the Mississippi river at the eastern boundary of that State. From Fort Gibson, in the Indian Terri-

tory, to the mouth of said river it is a large, navigable stream, and is used for the purposes of trade and commerce by vessels plying thereon.

The length of the river in the State of Kansas is about three hundred and ten miles. Its course is through a broad valley, and along its entire length within the State of Kansas are alluvial deposits of great depth, amounting, in the aggregate, to about two million five hundred thousand acres. The greater part of the said acreage and the greater part of the course of the river lies in the western half of the State. The elevation of the bed of the river through the State of Kansas is from three thousand three hundred and fifty feet above the level of the sea, at the Colorado line, to one thousand feet above said level at the point where it enters Oklahoma. The rainfall in the drainage area of said river in the western half of the State of Kansas is very light, and, by reason of the porous nature of the soil throughout said drainage area, the greater portion of the water so falling sinks into the earth, and but a small portion thereof finds its way to said river, except in the event of severe and unusual storms. The ordinary and usual rainfall in the major portion of the valley of said river in the State of Kansas is utterly inadequate to the growing and maturing of cultivated crops of any kind, because, *first*, the precipitation is very scanty; and, *second*, it does not fall during the growing season of the year.

The said river in its entire course through the State of Kansas has a natural fall of about seven and three-tenths feet per mile. The valley of the river in the State of Kansas is composed of sand covered with alluvial soil, and the river and the surface soil of the bottom lands in the State of Kansas are all underlaid with sand and gravel, through which the waters of said river have flowed from time immemorial, extending in width under the entire valley for its whole length through the State of Kansas. The natural course and flow of said river throughout its entire length in the State of Kansas is in and beneath the bed thereof and beneath the surface of the bottom lands of the entire valley of said river. That portion of the river which flows beneath the surface through the sand and gravel is called the "underflow." The "underflow" is confined to the valley of the river in the State of Kansas, and is coextensive with the valley in said State, and varies in volume with the amount of water in discharge in the river. There is no underflow to said river in the State of Colorado except in and under the bed of said river. The water which flows in the river from the State of Colorado into the State of Kansas furnishes the principal and almost the entire supply of water for the underflow in the valley of said river, and at its normal height the said underflow is of great and lasting benefit to the said bottom lands, both as to those which abut upon said river and as to those which do not; and is of great benefit to the people owning and occupying such lands, for that it furnishes moisture sufficient to grow ordinary farming crops in the absence of rainfall and furnishes water, at a

moderate depth below the surface, for domestic use and for the watering of animals. The flow of water in the river-bed is also of great value to the people in the vicinity by reason of the fact that the evaporation from said river tends to cool and moisten the surrounding atmosphere, thereby greatly promoting the growth of all vegetation, enhancing the value of lands in that vicinity, and conducing directly and materially to the public health and making the locality habitable. Owing to the dryness of the climate, the cloudlessness of the sky, the high elevation, and the prevailing winds, evaporation is rapid and great, being about sixty inches per annum at the east end of the river valley in Kansas, and ninety inches at the west line of the State.

Outside of said valley in the western half of the State of Kansas are several million acres of arid upland and plateau upon which grows a sparse but valuable grass upon which cattle may feed, and upon which they have, in times past, in vast numbers been fed and fattened, but the cattle so fed must have watering-places, and such watering-places must be in the river valley. And the availability and use of the said arid lands and the prosperity of the business of cattle-feeding thereon depend entirely upon the water, its convenience, depth, and supply, and if the surface flow of water in the bed of said river be wholly cut off from the State of Kansas, then the underflow will gradually diminish and run out, and the valley of the Arkansas river will become as arid and uninhabitable as are the upland and plateau along its course, since without said underflow the valley land will be unfit for cultivation and the arid lands unavailable for grazing.

The bottom lands in the valley of the Arkansas river in the State of Kansas are practically level and rise from three to fifteen feet above the water bed of the river, and are such as are ordinarily termed and will be herein referred to as "bottom lands." Nearly all of said bottom lands, including those which are adjacent to the bed of said river, are fertile and productive, valuable for farming purposes, and well adapted to the growing of corn, wheat, alfalfa, rye, domestic and wild grasses, orchards, fruits, vegetables, and all like crops, grains and grasses usually grown in that latitude of the United States. In addition thereto, all of said lands are valuable for grazing purposes and well adapted to the support of vast numbers of cattle, horses, sheep, and hogs.

Nearly all of the bottom lands of the said Arkansas valley, including those upon the banks of said river, are now owned, held and occupied by persons engaged in agricultural pursuits, and more than three-fourths of the bottom lands of said valley in the State of Kansas were and are occupied by persons owning or leasing said lands and residing thereon with their families. More than two-fifths of said bottom lands so situate in said valley in the State of Kansas, including more than two-fifths of those upon the banks of said river, are in a state of actual cultivation, and have been for many years past; and said lands now have, outside of the cities, an agricultural

population of more than 50,000 persons. The inhabitants of said valley are now, and have been since the first settlement thereof, as hereinafter set forth, engaged in the raising of corn, wheat, rye, alfalfa, hay, fruits, vegetables, cattle, horses, sheep and hogs and other products common to the latitude and climate.

Situated upon the banks of said river in the State of Kansas are numerous cities, towns, and villages, and among the cities so situated are Syracuse, Garden City, Cimarron, Dodge City, Kinsley, Larned, Great Bend, Sterling, Hutchinson, Wichita, and Arkansas City; all of which cities, except the one last named, are county-seats, and have an aggregate population of over 60,000 persons, whose rights are to a greater or less extent impaired by the wrongs herein complained of.

The actual value of the bottom lands in the valley of the Arkansas river, in the State of Kansas, is from five to one hundred dollars per acre, and the average value of all of the said lands is not less than twenty-five dollars per acre, provided said lands are permitted to receive the benefits arising from the natural and normal flow of water in said river, which benefits they would receive but for the wrongful acts done in and by the defendants herein named. By reason of the said wrongs, herein complained of, the value of said lands has shrunk many millions of dollars, which has been a direct loss to the citizens of the State of Kansas, and to the taxable wealth, and to the revenues of the State of Kansas and to the school system of the State as hereinafter set forth.

4. Your orator further says: All of the said bottom lands were originally a part of the public domain of the United States, and by the act admitting the State of Kansas into the Union the State became entitled, for school purposes, to sections sixteen and thirty-six of each governmental township, some of which sections are situated within the said valley, and a number of which adjoin the bed of said stream.

Under the act of Congress of March 3, 1863, entitled "An act for a grant of lands to the State of Kansas in alternate sections to aid in the construction of certain railroads and telegraphs in said State," there was granted to the State practically all of the odd-numbered sections of land in said valley lying north of a line four miles south of the north line of township twenty-six in said State. Said line is about four miles north of the city of Wichita, and extends to the west line of said State; and the grant included all the territory of the Arkansas valley west of Wichita, being four-fifths of said valley. All the requirements and provisions of said act of Congress were complied with prior to the year 1874 by the State of Kansas and by the Atchison, Topeka and Santa Fe Railroad Company, as to such of said lands as were located east of the west line of Ford county in said State as now located. Prior to said year 1874, the fee-simple title to said lands and all rights thereunto appertaining had been certified and conveyed by the United States to the State of Kansas, and by it to the said railroad company.

Between the years 1874 and 1883 the remaining sections of said lands, to wit, those lying west of said west line of Ford county, were so certified, transferred and conveyed to said State and by it conveyed. The amount of the lands so conveyed, which were situate in said valley and were a part of the bottom lands thereof, was not less than nine hundred thousand acres, a large portion of which abut upon and extend to the bed of said river. The other lands in said valley, being the even-numbered sections, were and have been at all times subject to entry as a part of the public domain of the United States and subject to be taken and have been taken and occupied by settlers thereon, under the land laws of the United States.

Prior to the admission of the State of Kansas into the Union, in 1861, many persons were settlers and residents of said valley, occupying and holding lands therein, more particularly along the line of the Santa Fe trail, which followed the river from a point near the present site of the city of Hutchinson to the west line of the State. During the years 1869, 1870, and 1871, the entire Arkansas valley, from the south line of the State of Kansas to the city of Great Bend, was taken and occupied by actual settlers, who subsequently acquired title to their lands under the laws of the United States of America and by purchase from the State and the said railroad company. The other lands situated in said valley, from Great Bend westward to the west line of the State of Kansas, were taken up during the time between the years 1872 and 1884, and have been occupied ever since by actual settlers and by purchasers from the State and from the said railroad company. All of the lands of said valley have been thus occupied, held and owned by said original settlers and their grantees ever since the above dates of settlement, and these settlers and their successors in interest have continuously held and owned, and do now hold and own, all of the riparian and other rights of every kind and nature in any way appertaining or belonging to said lands.

And your orator further shows, that all the territory of the State of Kansas became part of the territory of the United States by the treaty with the French Republic of the 30th of April, 1803, ceding Louisiana. That while said territory now within the State of Kansas so belonged to the United States, the Government and proper department thereof meandered the bed of the said river, and established the meander or boundary lines thereof, and said river from its mouth at the Mississippi river to the Colorado line became, was, is and has always been treated as a navigable river, and the bed of said river within said State of Kansas has never been sold or conveyed by the United States. That when Kansas was admitted into the Union as one of the United States, the title and control of the bed of said river within said State of Kansas passed to the State of Kansas, and that the State of Kansas, ever since the 29th day of January, 1861, has been, and now is, the absolute owner thereof, and the absolute and unrestricted right thereto ever since said date has been

and now is vested in the State of Kansas, in trust forever for the benefit of the whole people thereof.

5. Your orator further says: By an act of the Congress of the United States of March 2, 1889, it was enacted that the Secretary of the Interior be authorized to sell and convey to the State of Kansas lots numbered three, five, six, and seven, of section three, township twenty-seven south, of range twenty-four west, situated in Ford county, Kansas, on condition that the State should within twelve months thereafter pay or cause to be paid the sum of one dollar and twenty-five cents per acre for said lands, and should within three years establish and provide for the maintenance thereon of a home for the care and maintenance of officers, soldiers, sailors and marines who had served in the army and navy, and their dependent parents, widows, or orphans. Thereafter, and on the 13th day of June, 1889, the State of Kansas made payment to the United States of one dollar and twenty-five cents per acre for said lands, and on said date they were by the Secretary of the Interior, in pursuance of said act of Congress, transferred to the State of Kansas, and it has ever since used said lands for the maintenance of a soldiers' home thereon, in accordance with the provision of the aforesaid act of Congress. The lands so used consist of one hundred and twenty-six and fifty-six one-hundredths acres of the bottom lands of the Arkansas valley, adjoining and abutting upon the bed of said river. Said land is fertile and of a character well adapted to the raising of grain, fruits and vegetables when supplied with moisture. The natural rainfall in the vicinity is slight and insufficient for the maturing of crops, fruits, and vegetables, and the value of said lands for farming purposes depends entirely upon the flow of water in the bed of the river and upon the underflow beneath the land. The State of Kansas is now, and has, during its entire ownership of said tract, used a large portion of the same for the raising of grains, fruits, vegetables and grasses thereon for the needs of its said institution, and, as the owner of said land, the State of Kansas is entitled to the full, free and natural flow of all waters which naturally would flow in said river and beneath said land; and the rights of the State thereto are prior and superior to the rights or claims of any of said defendants or any other persons whatsoever.

6. Your orator further says: The State of Kansas is the owner of the fee-simple title to the northeast quarter (¼), the east half of the northwest quarter (¼), the southwest quarter (¼), and the southeast quarter (¼) of section nineteen (19), and the south half of the southeast quarter (¼) of section eighteen (18), all in township twenty-three (23) south, range five (5) west of the sixth principal meridan, situated in Reno county, Kansas, and has owned said lands since the year 1885. The State of Kansas has erected upon said lands a large institution built and used for the purpose of an industrial reformatory, where are confined and detained large numbers of the criminals of the State. The greater portion of the said lands so owned by the

State is suitable for and is used for farming purposes in connection with said institution, and for the growing of grain, grasses, fruits and vegetables for the needs of said institution. Said lands consist of about six hundred and forty (640) acres, and are situated within the valley of the Arkansas river, and are bottom lands furnished with moisture, sufficient for the growing of crops thereon, solely from the underflow and saturating waters of said river, and the rainfall upon said lands in ordinary seasons is naturally inadequate.

The State of Kansas acquired the title to said reformatory lands from divers persons and individuals who had previously owned and occupied them. The title to all that portion of said lands situate in section nineteen passed from the United States to the State of Kansas under and in pursuance of the act of Congress approved March 3, 1863, granting certain lands to the State of Kansas to aid in the construction of certain railroads, and said lands were located and were certified to the State of Kansas April 9, 1873; and on the 19th day of May, 1873, the said section of land, with other lands, were patented by the State of Kansas to the Atchison, Topeka & Santa Fe Railroad Company. In and by said act of Congress and the certification and location of said lands thereunder and the patent aforesaid, the full fee-simple title to said lands and all rights appertaining thereto were transferred from the United States of America to said railroad company, and said title and rights have passed by successive conveyances through various parties to the State of Kansas, and were acquired by it on August 14, 1885, as aforesaid, and have been ever since held by it. The title to that portion of said reformatory lands situate in section eighteen passed from the United States to one George S. Laverty, by a patent dated September 25, 1878, at which time said Laverty acquired the fee simple title to said premises and all rights appertaining thereto, all of which relate back to and date from the time of his entry upon said lands, more than five years prior thereto. Said title and rights in and to said lands have passed by successive conveyances until they are now vested in the State of Kansas as aforesaid; and the State is now, and has been since August 15, 1885, the owner in fee simple of said tract of land and all rights thereunto appertaining. By reason of the foregoing, the State of Kansas is entitled to the full natural flow of the water of the Arkansas river in its accustomed place and at its normal height and in its natural volume underneath all of the said reformatory lands. The rights of the State thereto are prior and superior to any right or claim of any of said defendants or any other persons whatsoever.

7. Your orator further says: By the constitution of the State of Colorado, adopted at or about the time of the admission of the State into the Union, and not since abrogated by the people of said State, it is provided in article fifteen thereof as follows:

"SEC. 5. The water of every natural stream not heretofore appropriated within the State of Colorado is hereby declared to be the property of the public, and the same is dedicated to the uses of the

people of the State subject to appropriation as hereinafter provided.

"SEC. 6. The right to divert unappropriated waters of any natural stream for beneficial uses shall never be denied. Priority of appropriation shall give the better right as between those using the water for the same purposes; but when the waters of any natural stream are not sufficient for the service of all, those using the water for domestic purposes shall have the preference over those claiming for any other purpose, and those using the water for agricultural purposes shall have the preference over those using the same for manufacturing purposes."

The legislature of the State of Colorado has from time to time passed divers and numerous laws purporting and pretending to authorize the diversion of water from said Arkansas river and its tributaries, in said State, for uses and purposes other than domestic; more particularly for the purpose of irrigating arid, non-riparian, non-saturated and waste lands for agricultural purposes in said State. In and by its said laws and through its officers and courts the said State has attempted to grant to its codefendants and to divers other persons, firms and corporations the right and authority to divert the waters of the Arkansas river and its tributaries, in Colorado, from their natural channels, and to cause said waters to flow into and through canals and ditches constructed for the purpose, extending great distances away from the natural channels of said streams, and to store said waters and to empty the same upon high arid lands, not riparian to said streams and not saturated thereby, as a result of the exercise of such pretended right, all of said waters are forever lost to such streams and are thus and thereby prevented from flowing into or through the State of Kansas.

Under and in pursuance of said constitutional provisions and the statutes of the State of Colorado, upwards of one thousand persons, firms and corporations, including those joined as defendants herein, claim to have acquired rights to divert water from said river and its tributaries, in the State of Colorado, for the purpose of irrigating such arid non-riparian and non-saturated lands in said State; and each of said persons, firms and corporations owns one or more ditches or canals to carry said waters from the natural courses of said streams. Many of said canals and ditches are of great capacity, and are many miles in length. Many of said persons, firms and corporations have constructed great reservoirs within which to store, and in which are stored for use, vast quantities of the water of said streams before using it for the purpose of irrigation, as herein set forth.

That the said owners are so numerous that your orator has been unable to ascertain and set forth all of the same or make them defendants herein, except such as are herein set out and made defendants hereto.

That in the aggregate the appropriations so as aforesaid attempted to be made and licensed, from the Arkansas river, amount to 4200

cubic feet per second, and from the affluents and tributaries thereof to 4300 cubic feet per second.

That the average flow of the Arkansas river in the State of Colorado does not at any point on said river exceed 700 cubic feet per second, and the average flow of the affluents and tributaries thereof does not in the aggregate exceed 700 cubic feet per second.

That as a result thereof the total average flow of said Arkansas river, together with the average flow of all the affluents and tributaries thereto, is taken out, used and absorbed as hereinbefore and hereinafter alleged. And no portion of the ordinary flow of the said Arkansas river is permitted to pass into the State of Kansas.

Said ditch owners, together with the State of Colorado, as hereafter set forth, are now diverting and at all times continue to divert from their natural courses the waters flowing in the bed of the Arkansas river and its tributaries, in said State, and are now carrying said waters to great distances from their natural courses and discharging them for agricultural purposes upon arid, non-riparian and non-saturated lands, where such waters are wholly lost to such streams and to the State of Kansas and its inhabitants. That such diversion is carried to such an extent that no water flows in the bed of said river from the State of Colorado into the State of Kansas during the annual growing season, and the underflow of said river in Kansas is diminishing and continuing to diminish, and if the said diversion continues to increase, the bottom lands of said valley will be injured to an enormous extent, and a large portion thereof will be utterly ruined and will become deserted and be a part of an arid desert.

The State of Colorado, through its laws, legislatures, officers, and agents, pretends to authorize and license the owners of said canals and ditches to take, carry away and so use the waters of said streams; and the State of Colorado, in addition to granting the right to take and use the water, also claims the right to regulate and control the distribution of such water by canal and ditch owners to the owners of lands so irrigated, and grants permission and license to landowners of said State to take and receive the waters flowing in said canals and ditches and use the same for irrigation purposes, and for the sale thereof as merchandise. In addition to the foregoing, other canals and ditches for the diversion of waters from said river and its tributaries are contemplated for the purpose of irrigating arid non-riparian lands; and the extension of branches and laterals to those canals and ditches now built are contemplated and intended by the people of the State of Colorado; as is also the obtaining of additional privileges not heretofore granted for the diversion of water from said river, and its tributaries, and the irrigation of lands not now irrigated.

The State of Colorado and the said defendant corporations claim and openly assert their right and power to do as they please with all the water of the Arkansas river within the borders of Colorado,

regardless of any rights which the State of Kansas or its citizens may have therein.

The State of Colorado has, since the year 1890, at and near the city of Canon City, in said State, constructed a great canal for the purpose of diverting water of the Arkansas river from its channel at said point and using the water for irrigation purposes upon arid non-riparian and non-saturated lands, so that the water will not return to or again flow in said river; which said canal is now owned, controlled and managed by the State of Colorado. The said State authorizes, directs and permits its agents and employees so to divert from said river into said canal water to the amount of seven hundred and fifty-six and $\frac{25}{100}$ cubic feet per second, thereby greatly diminishing the flow of water in the river, which said amount is approximately the natural flow of said river at the place of said diversion. Said water so diverted and taken is sold by the State of Colorado to persons owning lands in the vicinity of said canal, and the water is used by such owners for irrigating such arid non-riparian and non-saturated lands. The waters so diverted from said river by the State of Colorado would otherwise flow into the State of Kansas and through said valley, and be vastly beneficial.

The State of Colorado intends and is threatening to build, and will build or cause to be built, unless retrained therefrom, other canals similar in size, character, and design, with the purpose and intention of forever diverting other large quantities of water from said river and irrigating other arid non-riparian and non-saturated lands, and the legislature of the State of Colorado has authorized the construction of other such canals along the river in said State. The State of Colorado intends to, and will, unless restrained by this court, extend said canals and build branches and laterals therto, and will use the water diverted from said river to irrigate arid non-riparian and non-saturated lands not now or ever previously irrigated.

The said State of Colorado has, by and through legislation, made large appropriations of money for the construction and erection of reservoirs within its territory for the storage of water from streams tributary to the Arkansas river in said State, and has provided boards of control to have charge of the construction, maintenance and operation of such reservoirs, and has provided that the waters so stored in reservoirs may be sold and disposed of for the purpose of being used in the irrigation of lands which are arid and non-riparian to and not saturated by the streams from which such waters are taken. And your orator further states, upon information and belief, that the said State of Colorado has since the year 1891 erected and constructed and is now using not less than four of such reservoirs—one in each of the counties of Custer, El Paso, Chaffee, and Las Animas—each of which reservoirs takes, stores and holds vast quantities of water which would otherwise flow into the State of Kansas; and, by reason of the use of said waters as aforesaid, no

portion thereof is permitted to return to its natural channel or flow in said river.

The said State of Colorado is now preparing to construct and intends to construct, and unless restrained therefrom will construct, within its territory and near the said river and its tributaries, and at various points along the valley thereof, vast reservoirs within which further to store and hold the natural and the flood waters of said stream; and it is the intention and expectation of said State so to store and withhold and divert from the channel of said river all of the water thereof. And your orator states, upon information and belief, that surveys for such reservoirs have been made, and plans and specifications are being prepared for the construction of such reservoirs, and the State is preparing to enter upon the construction thereof. If said reservoirs are so constructed and operated by the State of Colorado, the natural flow of the river into the State of Kansas will be taken and held, and the waters thereof will be sold and used for the irrigation of arid and non-riparian and non-saturated lands not now irrigated, and will be forever lost to said river and the State of Kansas.

When the Territory of Kansas was organized, in the year 1854, it extended from its present eastern boundary to the summit of the Rocky mountains, and all of the present drainage area of the Arkansas river in Colorado was then included in the Territory of Kansas, and during all of the period from then to the organization of the State of Kansas the common law and the riparian rights herein claimed extended over the whole of the Arkansas valley and to the summits of the Rocky mountains, and had for many years prior thereto. By reason of the prior settlement, occupation and title of the inhabitants of the State of Kansas upon and to the lands situate in the valley of said river, including those upon the banks of said river, the State of Kansas and the owners of land in said valley did acquire, and now have the right to, the uninterrupted and unimpeded flow of all of the waters of said river into and across the State of Kansas. The rights so claimed by your orator accrued prior to any of the said diversions by or in the State of Colorado, and prior to the accruing of any of the pretended rights claimed by the State of Colorado, or by persons, firms or corporations now taking water from said river or its tributaries.

8. Your orator further says: The State of Colorado, the other defendants herein named, and other persons, firms and corporations engaged in taking water from said river and its tributaries as aforesaid, under and in pursuance of authority and license pretended to be granted therefor by the State of Colorado, have by so doing wrongfully, illegally and unlawfully diverted said water from the accustomed channel into and across the State of Kansas, and have greatly damaged and have irreparably injured the State of Kansas and the inhabitants thereof. And by reason of said diversion of water the fertility of all of the lands in said valley, including those upon the banks of said river as well as others, has been greatly di-

minished. During the spring and early summer, when crops are growing upon said valley lands in Kansas, the diversion of water in Colorado, as aforesaid, withholds from said Kansas valley lands, and particularly those upon the banks of said river, and those belonging to the State of Kansas above described, the waters to which said lands are entitled, with the result that the crops, trees and vegetation growing thereon languish and decline and in many places wither and perish; and wells which should furnish water for domestic use and animals become dry. The said damages are the proximate and necessary result of the diversion of said waters as aforesaid; and the amount of such damage is enormous and beyond computation, and amounts to vast sums annually, and such damages have increased year by year for the past ten years, substantially in proportion as the diversion of said waters in the State of Colorado has increased.

The property of your orator situated upon the banks of the river near Dodge city, and used for the purpose of a soldiers' home, as aforesaid, has been greatly damaged and especially injured by reason of the diverson from its channel of the water which would otherwise flow in the said river by and underneath the said tract of land. Its fertility has been greatly diminished, its water-supply lessened, and its salubrity and utility impaired, and, unless the natural and normal flow of water is restored, the value of said property will be entirely detroyed, and the same will be rendered unfit for use as a soldiers' home, or for any purpose whatever. And the same is true of the property of your orator situate near the city of Hutchinson, and used for the purpose of a State industrial reformatory.

That by reason of the diversion of said waters, as herein described, during the summer season and during the dry portion of the year, when there is neither rainfall in the State of Kansas nor melting snows in the State of Colorado, the bed of said river in the State of Kansas above the city of Wichita becomes practically and oftentimes wholly dry. The bed of said stream, through the territory above described, is without high banks, and, in its natural condition, was but a few inches or a few feet below the bottom lands adjacent thereto. These adjacent bottom lands are of a loose, sandy loam, and are unprotected on either side by hills or mountains, or by any natural forests, and the bed of said stream is almost wholly of sand. During said dry portion of the year said territory is subject to high and constant winds, and said winds change and fill up the bed of the stream and the natural channel thereof with drifting sand, dirt, and debris, until it is practically level with the lands adjacent thereto, and said obstructions are rapidly becoming permanent by growing vegetation, willows, and trees. And at the times of sudden and excessive rainfall in the State of Kansas, or sudden and excessive melting of the snows in the State of Colorado, the flood waters thereof cannot and do not flow down the natural channel of said river, now filled and obstructed as aforesaid, but overflow said adjacent bottom lands, washing channels therethrough, depositing dirt and debris thereon, and doing great damage to stock pastured,

crops grown and improvements situate thereon, and greatly injuring and decreasing the value of said lands.

9. Wherefore, your orator prays the aid of this honorable court, and asks that a decree may be entered prohibiting, enjoining and restraining the State of Colorado from granting, issuing, renewing, or permitting to be granted or issued or renewed, any charter, license, permit or authority to any person, firm or corporation for the diversion of any of the waters of the Arkansas river or of any of its tributaries from their natural beds, courses and channels within the State of Colorado, except for domestic use; or to construct, maintain and operate any canals, ditches, branches, laterals or reservoirs now in use in said State.

Your orator further prays that the said State of Colorado as a State, and each and all the other defandants herein, may be prohibited, enjoined, and restrained from constructing, owning, or operating, either directly or indirectly, any canal or ditch whereby the usual and ordinary flow of the waters of said river, or any of its tributaries, shall be diverted from their natural courses and channels; and from constructing, owning, operating or using any reservoir for the storage of the usual and ordinary flow waters of said river, or any of its tributaries, for purposes of irrigation, sale or merchandise.

Your orator further prays this honorable court to fix and define the respective rights of your orator and the defendants herein in and to the waters of the Arkansas river, its affluents and tributaries, and to enter such decree herein as may be necessary for the adequate protection of the rights so fixed and defined.

Your orator further prays, that it may have such other and further relief in the premises as the nature of the circumstances of this case may require and as to this honorable court shall seem meet.

Forasmuch, therefore, as your orator is without remedy in the premises except in a court of equity, may it please your honors to grant unto your orator not only a writ of injunction conformable to the prayer of this amended bill, but also a writ of subpœna of the United States of America directed to each and every of said defendants except the State of Colorado, thereby commanding them on a day certain, therein to be named, and under a certain penalty, to be and appear before your honorable court, then and there to answer all and singular the allegations of the foregoing amended bill (answer under oath being hereby especially waived), and to abide and perform such order and decree in the premises as may be awarded against them.

And your orator, as in duty bound, will ever pray, etc.

C. C. COLEMAN,
Attorney-General of the State of Kansas,
and Solicitor for Complainant.

N. H. LOOMIS,
F. DUMONT SMITH,
S. S. ASHBAUGH,
Of Counsel.

[Endorsed:] Supreme Court U. S., October term, 1903. Term No. 7, original. The State of Kansas, complainant, vs. The State of Colorado *et al.* Amended bill of complaint. Filed August 17, 1903.

And afterwards, to wit, on the 18th day of August, A. D. 1903, a subpœna was issued and delivered to the marshal for service.

And afterwards, to wit, on the 14th day of September, A. D. 1903, an appearance for defendant, State of Colorado, was filed in the words and figures following, viz:

Order for Appearance.

No. 7, Original.

Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL., Defendants. } No. 7, Orig'l.

The clerk will enter my appearance as counsel for the State of Colorado, defendant.

(Name.) CHARLES D. HAYT,
(P. O. address.) 450 Equitable building, Denver, Colorado.

☞ NOTE.—Must be signed by a member of the bar of the Supreme Court United States. Individual and not firm names must be signed.

[Endorsed:] Supreme Court U. S., October term, 1903. Term No. 7, orig'l. Appearance for def't, State of Colorado. Filed Sept. 14, 1903.

And afterwards, to wit, on the 6th day of October, A. D. 1903, the subpœna, and proof of service of same, was filed in the words and figures following, viz:

THE UNITED STATES OF AMERICA, *ss:*

The President of the United States of America to The Bessemer Ditch Company, a corporation; The Oxford Farmers' Ditch Company, a corporation; The Otero Canal Company, a corporation; The Lake Canal Company, a corporation; The Riverside Ditch Company, a corporation; The Catlin Consolidated Canal Company, a corporation; The Graham Ditch Company, a corporation; The Lamar Land and Canal Company, a corporation; The Amity Canal and Reservoir Company, a corporation; The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, a corporation; The Fort Lyon Canal Company, a corporation; The Colorado Land and Canal Company, a corporation; The Great Plains Water Company, a corporation; The Arkansas Valley Sugar Beet and Irrigated Land Company, a corporation; The Colorado Fuel and Iron Company, a corporation; and The Bent-Otero Improvement Company, a corporation, Greeting:

[SEAL.]

For certain causes offered before the Supreme Court of the United States, having jurisdiction in equity, you are hereby commanded that, laying all other matters aside and notwithstanding any excuse, you be and appear before the said Supreme Court holding jurisdiction in equity within sixty days after the service of this subpœna upon you, at the city of Washington, in the District of Columbia, being the seat of the National Government of the United States, to answer unto the bill of complaint of the State of Kansas in the said court exhibited against you and the State of Colorado.

Hereof you are not to fail at your peril.

Witnes- the Honorable Melville W. Fuller, Chief Justice of the United States, at the city of Washington, the 18th day of August, 1903.

JAMES H. McKENNEY,
Clerk of the Supreme Court of the United States.

Office of the Marshal.

Supreme Court of the United States, Washington, D. C., October Term, 1903.

THE STATE OF KANSAS
vs.
THE STATE OF COLORADO. } No. 7, Original.

The within process came to my hand the 18th day of August, 1903, and for the purpose of serving same I, J. M. Wright, marshal of the Supreme Court of the United States, do hereby authorize and deputize Dewey C. Bailey, U. S. marshal for the district of Colorado to serve the within process on the parties named therein and make due return thereof.

J. M. WRIGHT,
Marshal of the Supreme Court of the U. S.

UNITED STATES OF AMERICA,
District of Colorado, } ss:

I hereby certify that I received the within writ at Denver, State of Colorado, on the 7th day of September, A. D. 1903, and that I have duly executed the within writ by delivering to C. K. McHarg, secretary of the Bessemer Ditch Company and H. R. Holbrock, president of the Lake Canal Company, both at Pueblo on the 8th day of September, A. D. 1903; T. J. Bernard, president of the Oxford Farmers' Ditch Company, at Fowler on the 8th day of September, A. D. 1903; and W. A. Colt, president of the Rocky Ford, Canal, Reservoir, Land, Loan and Trust Company, and W. A. Colt, president of the Bent, Otero Improvement Company, and J. N. Beaty, secretary of the Catlin Consolidated Canal Company, all at Manzanola on the 9th day of September, A. D. 1903; and C. C. Goodale, secretary of the Graham Ditch Company, and A. E. Bent, manager of the Lamar Land and Canal Company, both at Lamar on the 9th day of September, A. D. 1903; and Frank Kreybell, secretary of the Ft. Lyon Canal Company at Las Animas on the 10th day of September, A. D. 1903; and Rufus Phillips, secretary of the Riverside Ditch Company at La Junta on the 10th day of September, A. D. 1903; and W. H. Wiley, manager of the Arkansas Valley Sugar Beet and Irrigated Land Company, and D. C. Beaman, secretary of the Colorado Fuel & Iron Company, both at Denver, on the 10th day of September, A. D. 1903; and each of them, personally, a copy of the within writ, and by making known to each of them the contents thereof, by reading to each of them the process, and by showing the seal thereof to each of them, respectively on the said days and dates.

After due search and diligent inquiry I have been unable to locate any of the officers, agents or stockholders of the Otero Canal Company, the Amity Canal & Reservoir Company, the Colorado Land & Canal Company, and the Great Plains Water Company in this district.

DEWEY C. BAILEY,
U. S. Marshal,
By EDWIN H. DAVIS, Deputy.

Office of the Marshal.

Supreme Court of the United States, Washington, D. C., October Term, 1903.

THE STATE OF KANSAS
vs.
THE STATE OF COLORADO. } No. 7, Original.

Executed as certified by the endorsements hereon, and return of same made this 22d day of September, 1903.

J. M. WRIGHT,
Marshal of the Supreme Court of the United States.

[Endorsed:] Supreme Court U. S., October term, 1903. Term No. 7, original. The State of Kansas, complainant, vs. The State of Colorado *et. al.* Subpœna and marshal's return. Filed Oct. 6", 1903.

And afterwards, to wit, on the 14th day of October, A. D. 1903, the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL. } No. 7, Original.

On motion of Mr. Joel F. Vaile, of conusel, leave is hereby granted to file the answers of the State of Colorado and the Graham Ditch Company to the amended bill of complaint herein.
October 14th, 1903.

And on the same day, to wit, on the 14th day of October, A. D. 1903, answers were filed in the words and figures following, viz:

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL., Defendants. } Original Proceeding No. 7.

Answer of The State of Colorado, Defendant, to the Amended Bill of Complaint.

Nathan C. Miller, attorney general of Colorado, solicitor for defendant.
E. O. Wolcott, Joel F. Vaile, Charles D. Hayt, Platt Rogers, C. W. Waterman, Clyde Dawson, F. E. Gregg, of counsel.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL., Defendants. } Original Proceeding No. 7. October Term, 1903.

Separate Answer of the Defendant, The State of Colorado, to the Amended Bill of Complaint of The State of Kansas, Complainant.

This defendant, now and at all times hereafter saving to itself all and all manner of benefit or advantage of exception or otherwise that can or may be had or taken to the many errors, uncertainties

and imperfections in the said amended bill contained, for answer thereto, or to so much thereof as this defendant is advised it is material or necessary for it to make answer to, separately answering, saith:

I.

This defendant, The State of Colorado, alleges that on the first day of August, 1876, it was admitted into the Union and then became and ever since said date has been and now is a sovereign State; that within the boundaries of its own territory it possesses in full the rights and prerogatives of sovereignty, save as to that portion of power delegated to the Federal Government by the Constitution of the United States, and that this defendant, the said State of Colorado, is foreign to the State of Kansas for all but Federal purposes.

That being so sovereign within its own territory, this defendant has the plenary and exclusive right and power to control and regulate the use of non-navigable waters within its boundaries, including non-navigable rivers and other streams, and that it has never surrendered this sovereign power over such waters, rivers, and streams, nor delegated such power, nor any portion thereof, to any other sovereignty, either National or State.

And this defendant alleges that the Arkansas river named in the complainant's bill is a stream having its sources within the territory of the State of Colorado and flowing within said State for many miles until it crosses the eastern boundary thereof and enters the State of Kansas; that said river is not navigable within either the State of Colorado or the State of Kansas and that the same is not an avenue or instrumentality of interstate commerce as between the States of Colorado and Kansas. The use of the waters of said stream by diversion thereof, and application of the same upon the lands in the valley of said river within the territorial limits of the State of Colorado, is essential to the life and well being of the inhabitants of said valley in Colorado and the right of continued use of the said waters is as vital to said inhabitants as in the land on which they dwell. This defendant alleges that the jurisdiction and rights of the State of Kansas, either in its sovereign capacity or as a proprietor of lands, do not extend into the State of Colorado; and this defendant further respectfully alleges that under the rules and principle of international and interstate law, the sovereign rights of this defendant over the water of the said Arkansas river are not servient to the sovereignty or rights of the State of Kansas and that the said State of Kansas has no dominant estate, right or jurisdiction as against this defendant or its people, in that part of the Arkansas river flowing in the State of Colorado, and that the State of Colorado cannot be subjected to the burden of arresting its development, or of denying to its inhabitants the use of an element, which nature has supplied entirely within its own territory, and without which, and the free use thereof, its lands would be uninhabitable.

And this defendant respectfully represents that this honorable court is without power or jurisdiction to deprive this defendant by judicial decree, or otherwise, of any of its attributes or rights of sovereignty acquired and retained by it as one of the States of the Union, or to impair the same without its consent. That this defendant, The State of Colorado, out of respect for this honorable court, and in respectful consideration of the claims of its sister State Kansas, makes full answer to the bill of complaint of said State of Kansas as hereinafter set forth, but in so doing the State of Colorado does not waive any of its sovereign rights or consent that the same or any part thereof may be destroyed or impaired.

II.

This defendant for further answer to the bill of complaint, says:

1. This defendant admits that the State of Kansas and the State of Colorado, respectively, were admitted into the Union at the dates set forth in the amended bill, and that the original bill in this proceeding and the amended bill were and are exhibited and the proceedings in reference thereto have been and are being prosecuted as in the bill alleged, and admits that the rise, course, drainage, area and general physical characteristics of the Arkansas river and of the valley thereof, except as hereinafter set forth, are as stated in the said amended bill of complaint.

2. This defendant denies that the said Arkansas river, after leaving the mountains, is a navigable stream under the laws and departmental rules and regulations of the United States. This defendant admits that the lands bording on the Arkansas river and its tributaries in the State of Colorado, as to that part thereof situated within the Rocky mountains and in the foothills at the eastern base thereof, are of such a character that they are not saturated to an appreciable extent by the waters flowing in said river or its tributaries, but denies that said lands herein mentioned are arid or barren up to the margin of said streams or at all, but, on the contrary, alleges that there has in the past been, and to a certain extent now is, a growth of timber and other vegetation thereon, and this defendant alleges that from the foothills on the eastern base of the said Rocky mountains and thence to the eastern boundary of the State of Colorado, the said lands bordering upon the Arkansas river and its tributaries in the State of Colorado are of like character to the lands in the western one hundred and fifty miles of the State of Kansas, and that the same are of like physical characteristics.

3. This defendant denies that any diminution of the flow of said river from the State of Colorado into the State of Kansas is wholly or mainly attributable to the diversion of the waters of said stream in the State of Colorado, and denies that there has been any wrongful diversion of said waters within the State of Colorado. This defendant denies that the normal flow of said river at the State line for ten months in the year, or for any considerable period, is up-

wards of two thousand cubic feet per second, and, on the contrary, alleges that in the absence of any irrigation in the State of Colorado, or any diversion of the waters of said stream in said State, the normal flow, exclusive of periods of flood, would at the said State line be less than five hundred cubic feet per second of time. This defendant denies that the tributaries of said river in the State of Kansas are few in number, or that the same do not or could not furnish water sufficient to cause a continuous stream to flow in the bed of said river as to that portion of said stream east of the 99th meridian (west of Greenwich) and this defendant alleges that east of said 99th meridian there are many streams of water tributary to and furnishing a large supply of water to said Arkansas river, and in this connection this defendant alleges that the said Arkansas river, within the State of Kansas, drains an area of more than twenty thousand square miles, and that in the eastern half of the course of said river within said State there is ample rainfall sufficient in itself to create and continue a large stream of water. This defendant admits that the rainfall in the drainage area of said river in the western part of the State of Kansas is light and that a part of the water so falling sinks into the earth, but this defendant denies that only a small portion thereof finds its way to said river, and on information and belief alleges that substantially all thereof, by drainage or by seepage, ultimately supplies the flow of water in the channel of said stream. This defendant denies that the ordinary and usual rainfall in that part of the valley of said river lying east of the 98th meridian is inadequate for the growing and maturing of cultivated crops, but admits that in the western part of the said State of Kansas such rainfall is inadequate for so growing and maturing cultivated crops, and alleges that in the portions of said State so affected the inhabitants thereof have resorted to and are now daily practicing the method of appropriation of water from said Arkansas river, and using the same for the irrigation of lands, in the same manner as in the said bill of complaint is alleged to be done in the State of Colorado.

4. This defendant denies that from time immemorial, or at all, the waters of said river have flowed through underlying sand and gravel extending in width under the entire valley of the Arkansas river through the State of Kansas, or for any material portion thereof, and denies that any part of the course and flow of said river is beneath the surface of the bottom lands of the valley of said river, or that the course or flow thereof is of any greater width than the channel of said river between its banks, or that there is any under-flow of water co-extensive with the valley of said river passing from the State of Colorado into the State of Kansas, or in, or through said State of Kansas. This defendant admits that there are underground waters in the valley of the said Arkansas river outside of and away from the channel of said stream, but on information and belief alleges the same to be the ordinary water table of the country, and that the same does not constitute an under-flow of the said Arkansas

river, and this defendant denies that as to such underground waters designated in the complaint as an "under-flow" that there is any difference whatsoever between the State of Colorado east of the foothills and the said State of Kansas, but alleges that there is a similarity of physical characteristics in that respect in the valley of the Arkansas river both east and west of the boundary line separating said States. This defendant denies that such underground water, whether called "underflow" or otherwise, furnishes sufficient moisture to grow ordinary farming crops in the absence of rainfall, unless the same be supplemented by a system of irrigation such as is used in the State of Colorado and in the western part of Kansas. This defendant, upon information and belief, denies that the evaporation from said river, to any appreciable extent or material degree, tends to cool or moisten the surrounding atmosphere, or promote the growth of vegetation, or enhance the value of lands, or conduce directly or materially or at all to the public health or the making of the locality habitable. This defendant admits that evaporation from said stream is rapid and great, and that it is greater at the west line of the State of Kansas than it is at points farther east, and in this connection this defendant alleges that such evaporation is yet greater in the State of Colorado between the point where said river leaves the foothills and the point where it crosses the boundary between Kansas and Colorado, and this defendant alleges that under the system of irrigation used in the State of Colorado, the injury, if any, resulting to the inhabitants of the State of Kansas through the loss of water by evaporation is less than it would be if there were no such irrigation system in use within the State of Colorado.

This defendant admits that in the western half of the State of Kansas are many acres of arid upland and plateau bearing grass upon which cattle may feed, and that the cattle so fed must have watering places, and this defendant alleges that the number of such watering places in western Kansas has not been diminished, but, on the contrary, has been increased by the methods of irrigation used in the State of Colorado, and especially through the effect of return waters in times when otherwise there would be small flow in the channel of said river, as hereinafter more specifically set forth. This defendant admits that if the surface flow of water in the bed of said river should be "wholly" cut off from the State of Kansas, that the underground waters under the adjacent bottom lands called in the bill of complaint "under-flow" would diminish, but, upon information and belief, this defendant alleges that such diminution would result only because of the increased drainage resulting from such process, but this defendant alleges that the system of irrigation practiced in the State of Colorado has not had the effect, and never can have the effect of wholly or materially cutting off from the State of Kansas a surface flow of water in the bed of said river, and, on the contrary, alleges that said irrigation system equalizes the flow of said river in the channel thereof through the State of Kansas,

diminishing the volume of flood water and increasing the supply in periods of comparative drought.

5. This defendant admits that that part of the bottom lands of the river lying east of the 98th meridian (west of Greenwich) including those adjacent to the bed of said river are fertile and productive and adapted to the growth of crops mentioned in the bill, and that said lands are valuable for grazing, but this defendant denies that in the western part of the State of Kansas said bottom lands are fertile or productive or valuable for farming purposes or adapted to the growing of corn, wheat, alfalfa, rye, domestic grasses, orchards, fruits, vegetables, or like crops, grains or grasses, except by the aid of irrigation and by the diversion and appropriation of water from the said Arkansas river, which said diversion and appropriation of water is, under the sanction of the laws of the State of Kansas as hereinafter set forth, practiced by the inhabitants of that portion of the State of Kansas west of the 98th meridian aforesaid.

6. Whether or not the actual value of the bottom lands in the valley of the Arkansas river in the State of Kansas is the value set up in the bill of complaint, this defendant has not, and cannot obtain, sufficient information upon which to base a belief, but this defendant denies that the value of said lands is in any degree dependent upon the said lands being permitted to receive the benefits arising from the natural and normal flow of water in said river, and denies that the acts alleged to have been done by this defendant and its inhabitants are wrongful, and this defendant denies that by reason of the alleged wrongs in the said bill of complaint set forth, or otherwise, the value of said lands has shrunk many millions of dollars, or in any sum whatsoever, so far as such value is dependent upon the use of the waters of said Arkansas river, and denies that the said alleged wrongs have resulted in a loss to the citizens of the State of Kansas, or to the taxable wealth, or to the revenue of said State, or to the school system thereof, in any amount or extent whatsoever.

7. This defendant admits the acquisition by the State of Kansas of sections numbered 16 and 36 of each Governmental township, and admits the derivation of title to certain alternate sections of land to aid in the construction of certain railroad and telegraph lines in said State as in the bill of complaint set forth, and that the said lands have been conveyed and are now held by the grantees thereof, and this defendant admits the settlement of certain of the lands in the State of Kansas in the Arkansas valley from the south line of the State of Kansas to the city of Great Bend, and subsequently the settlement of certain lands from Great Bend westward to the State line of the State of Kansas, and that the settlers thereon and their successors in interest have continuously held and owned all of the riparian and other rights of every kind and nature appertaining to or belonging to said lands, but this defendant alleges that such "riparian and other rights" so held by said settlers and their successors in interests were at all times and now are subject to the

riparian rights of other proprietors of lands in the valley of the Arkansas higher up said stream, and subject also to the right of the inhabitants in the valley of said Arkansas river and those who should from time to time become inhabitants therein to appropriate the waters of said stream and use the same in the irrigation of lands within the valley of the said Arkansas river through any portion of its course, as hereinafter more specifically set forth.

8. This defendant denies that all of the territory of the State of Kansas became a part of the territory of the United States by the treaty with the French Republic of April 30th, 1803, ceding Louisiana, and, on the contrary, alleges that all that portion of the said State of Kansas lying west of the 100th meridian (west of Greenwich) and south of the Arkansas river was never derived under said treaty and that said portion of said State never belonged to the French Republic, and in that behalf this defendant alleges that the said portion of said territory, being that portion of Kansas adjoining the State of Colorado, and on the south side of the Arkansas river, was derived by the United States from the Republic of Texas, which in turn succeeded in sovereignty over said territory to the united Mexican States. This defendant again denies that the said Arkansas river is now, or at any time has been, a navigable river in the State of Kansas or that it has at any time been treated as such, or that the title to the bed of said river in the State of Kansas ever passed to said State, or that said State is now or ever has been the owner thereof, or entitled to the control thereof, save and except that as a political organization it has sovereignty over the same, or that it has ever assumed to exercise any authority over said river or the bed thereof, except as by an act of the legislature of the State of Kansas passed in 1886, it declared that the right to the use of running water flowing in a river or stream of Kansas for the purposes of irrigation might be acquired by appropriation, and by a like act passed in 1891 it declared that in that portion of the State west of the 99th meridian all natural waters standing or running should be devoted—first, to purposes of irrigation in aid of agriculture, subject to ordinary domestic uses; and secondly, to other industrial uses, and that the same might be diverted from the natural beds, basins or channels for such purposes and uses, and by like acts subsequently passed it has enlarged and extended the right to use the natural waters of said State for irrigation purposes, eastward to the 98th meridian.

9. This defendant has no knowledge of the several conveyances or grants of lands in the valley of the Arkansas river in the State of Kansas heretofore made by the Government of the United States, but avers that all of the conveyances or grants referred to in said bill of complaint were made subject to all rights to water from said river for irrigation purposes theretofore, and thereafter to be, acquired, and were taken with full knowledge on the part of said State of Kansas and by each and every grantee of said lands that the waters of said river had been, were being and would be appropriated in the State of Colorado for beneficial uses in the irrigation of land,

and that the lands in said valley in the State of Kansas west of the 98th meridian and in the State of Colorado could only be made available for agricultural purposes by like appropriation and use, and that the Government of the United States as the primary owner of said lands had assumed that it held the same subject to the appropriation of the waters of said river for irrigation purposes, and that all patents of lands granted after July 9th, 1870, should be subject to all vested and accrued water rights over said river.

10. As to that certain tract of land described in paragraph 5 of plaintiff's bill, consisting of lots numbered 3, 5, 6 and 7 of section 3, township 27 south, of range 24 west, in Ford county, Kansas, alleged to be used for the maintenance of a soldier's home, this defendant alleges upon information and belief that the said State of Kansas as a proprietor of said lands has not made and does not now make any beneficial use of the waters flowing in the channel of the said Arkansas river for the improvement of said lands or the maintenance of said soldiers' home, and this defendant denies that the value of said lands for farming purposes depends upon the flow of water in the bed of the river or upon the so-called under-flow beneath the said land, and under the circumstances and conditions of the use of said water this defendant denies that the said State of Kansas is entitled to the full, free and natural flow of all waters which naturally would flow in said river to or beneath said land, and denies that the rights of the State of Kansas thereto are prior or superior to the rights or claims of this defendant or of the inhabitants of the State of Colorado, so far as pertains to the waters of the said Arkansas river.

11. As to those certain lands described in paragraph 6 of the complainant's bill as being in sections 18 and 19, township 23 south, of range 5 west of the sixth principal meridian in Reno county, Kansas, and designated as reformatory lands, this defendant alleges upon information and belief that the said State of Kansas as the proprietor of said lands has never made any beneficial use of the waters of the Arkansas river flowing by or near said lands, and this defendant denies that, under the circumstances and conditions affecting the said Arkansas river and the waters thereof, the said State of Kansas is entitled to the full and natural flow of the water of the Arkansas river in its accustomed place or at its normal height or in its natural volume underneath or by the said reformatory lands, and denies that the rights of the said State of Kansas are prior to the rights of this defendant or of the inhabitants of the said State of Colorado in the waters of said Arkansas river.

12. This defendant denies that the legislature of the State of Colorado has passed laws authorizing or licensing the diversion of water from said Arkansas river, or has granted to any person, firm or corporation the right or authority to make such diversion, but, on the contrary, avers that said legislature has at all times recognized the right to make such diversion as one existing independent of any action by it and as one founded on necessity and on the

usages and customs of the arid region of the United States existing prior to the adoption of the constitution of the State of Colorado, and approved and confirmed by the statutes, decisions and rulings of the legislative, judicial and executive departments of the United States, and said legislature has never assumed the power to either grant or restrain the right to divert the waters of the Arkansas river for irrigation or other purposes or to do more with respect to such diversions than to regulate and to control the same by appropriate legislation.

And this defendant denies that as a result of the exercise of the rights alleged in the amended bill to be claimed by the State of Colorado all of the waters of the said Arkansas river are forever lost to said stream and are thereby prevented from flowing into and through the State of Kansas, and, on the contrary, alleges that as a result of the irrigation systems in vogue in the State of Colorado and by the storage and return of waters through such irrigation systems, all the surplus of such waters not actually consumed in the supply of vegetation is returned to the said Arkansas river and flows down into and through the State of Kansas, and the flow of the said Arkansas river in the State of Kansas is thereby equalized, the dangers from flood diminished and the supply of water in times of comparative drought increased.

And this defendant further alleges that the allegation in the amended bill as to the appropriations of water from the Arkansas river there stated to be 4,200 cubic feet per second from the said river, and from the affluents and tributaries thereof 4,300 cubic feet per second, does not represent the actual diversion of said waters, or the diminution of the volume of water flowing in the channel of said river; that waters returned to the channel of the stream from ditches farthest up the stream are again taken out by ditches lower down on the stream, and that to a large extent the same water is repeatedly used in successive ditches, and this defendant denies that as a result of such appropriations, or otherwise, the total average flow of the said Arkansas river or the total average flow of its affluents and tributaries is taken out, used or absorbed as in the bill of complaint alleged, and denies that any considerable portion of the ordinary flow of said Arkansas river is prevented from passing into the State of Kansas, and, on the contrary, alleges that the major part of the aggregate amount of water derived from the channel of the said Arkansas river in the State of Colorado, again by drainage, seepage and return waters, enters the said stream and the channel thereof and continues to flow into and through the State of Kansas.

13. This defendant admits that ditch owners are diverting from the natural channel the waters flowing in the bed of the Arkansas river and it tributaries in the State of Colorado, but denies that they are carrying said waters great distances from their natural courses or discharging them upon non-riparian lands in the sense in which the word "riparian" is used in the assertion of the complainant's claims, and this defendant alleges that all of the waters diverted

from the channel of the Arkansas river in the State of Colorado are used, and used solely, within the valley of the Arkansas river, and and while the same are discharged for agricultural purposes upon arid lands, such lands are valley lands in the drainage of the said Arkansas river, and this defendant alleges that the waters so diverted, after being used upon the lands so lying in the valley of the Arkansas, are returned to said channel, diminished only to such extent as is necessary and inevitable from the use of the same for agricultural purposes, and this defendant denies that such waters are wholly lost to such streams, or to the State of Kansas, or to its inhabitants, or that such diversion is carried to such an extent that no water flows in the bed of said river from the State of Colorado to the State of Kansas during the annual growing season or that the so-called under-flow of water in Kansas is thereby diminished, and, on the contrary, this defendant alleges as heretofore stated that the return waters from such systems of irrigation again enter the channel of the said river, and that the same do flow into the State of Kansas and through the said State, and this defendant denies that by the diversion of water from the said river in the State of Colorado the bottom lands of said river have become or will become injured, ruined or deserted.

14. This defendant denies that the State of Colorado or the corporations joined with it as defendants in this cause claim or openly assert their right or power to do as they please with all of the waters of the Arkansas river within the borders of Colorado regardless of any rights which the State of Kansas or its citizens may have therein, but this defendant, and, as this defendant is advised, the corporations associated with it as defendants herein, do claim and assert that they have the right and power to apply the water of the Arkansas river within the borders of Colorado to beneficial and necessary uses for the development of the country and the support of the inhabitants thereof upon those lands situated within the valley and drainage of the Arkansas river, returning the said waters after such use and to the extent of any surplus remaining from such use into the channel of the Arkansas river.

15. This defendant admits that a canal was commenced about the year 1890 near Canon City, Colorado, under State control, but alleges that the construction thereof was thereafter abandoned, and that no water has at any time been diverted from said river into or through said canal by this defendant, or in its behalf, and that this defendant has not at any place along said river taken or diverted any of the water thereof that would otherwise have flowed into the State of Kansas as a part of the usual and ordinary flow of said river, and is not now so doing or intending so to do, or to construct works whereby the same may be done.

16. This defendant admits that certain reservoirs have been constructed with money appropriated by the legislature of the State of Colorado in which to store the flood and storm waters of certain ributaries of said Arkansas river which would otherwise overflow

the banks of said tributaries, and said waters so stored have been discharged from said reservoirs into said tributaries during periods of low water for the purpose of equalizing the flow of water in said tributaries so that the same might be used for irrigation purposes by private appropriators below, but this defendant has not stored, nor does it intend to store, the ordinary and usual flow of said river or its tributaries, nor to interfere by storage reservoirs already or hereafter to be constructed with the usual and ordinary flow of said river in the State of Kansas.

17. This defendant denies that when the Territory of Kansas was created or the State of Kansas admitted to the Union, the water of said Arkansas river was wholly unappropriated, or that the common law as to riparian rights, as claimed in said amended bill of complaint, extended over said valley in the Territory of Kansas, or that the owners of lands along said river were entitled to the unimpeded flow of the water of said river, and, on the contrary, avers that numerous appropriations of said water had been made for irrigation purposes long prior to the creation of said Territory, and many more were made prior to the conveyance by the Government of the United States of any of the lands lying along or adjacent to said river, and that the necessity and right to divert the water of said river for the reclamation of arid land had long previous to the creation of said Territory been asserted and exercised by the persons in possession of said lands, and said necessity and right were thereafter recognized by the legislature of the Territory of Kansas, and all lands along said river acquired by the State of Kansas or by individuals or corporations within the Territory or State of Kansas were taken and held with full knowledge of the necessity of diverting the water of said river for the purpose of reclaiming and making productive the lands along said river and of the usages and customs there prevailing authorizing the same, and that appropriations had been, were being and would be made in that portion of the valley which is now within the jurisdiction of the State of Colorado, and that to the extent of said appropriations the flow of water of said river might by said usages and customs be lawfully impeded for the purpose of applying the same to beneficial uses within the valley of said Arkansas river.

18. This defendant denies that by the taking of water from said river in the State of Colorado in the manner alleged in said bill of complaint the State of Kansas, or any of its citizens, or the owners of land along said river in the State of Kansas, have been injured in any degree whatever, or that the fertility of the lands or the use thereof to the fullest extent to which the same is naturally capable of use, have been diminished or impaired, or that the crops, trees or vegetation growing along said river have perished or will perish, or that the wells have become or will become dry, or that the salubrity or healthfulness of said valley or any of the lands adjacent to said river have been or will be impaired.

And this defendant denies that by reason of the diversion of said

waters as in the complaint alleged during the summer season or during the dry portion of the year, the bed of said river in the State of Kansas above the city of Wichita becomes practically or oftentimes wholly dry, and this defendant alleges that if in said portion of the said State of Kansas the bed of said stream and the natural channel thereof is becoming filled with drifting sand, dirt or debris, and said obstructions are rapidly becoming permanent by growing vegetation, and if at the time of sudden and excessive rainfall in the State of Kansas and of the sudden and excessive melting of snows in the State of Colorado the flood waters thereof can not flow down the natural channel of said river, so filled as aforesaid, but travel the adjacent bottom lands, washing channels therethrough and depositing dirt and debris thereon and doing great damage to stock pastures, crops grown or improvements situated thereon, and injuring or decreasing the value of said lands, such effects are not attributable in any degree whatsoever to the irrigation system within the State of Colorado, but the same are attributable to and fully explained by other causes not connected with the diversion and appropriation and use of water for irrigation purposes in the State of Colorado, and this defendant alleges that the evils so alleged to exist are diminished rather than intensified by the existence of said irrigation systems within the State of Colorado.

III.

This defendant for further answer to the bill of complaint, says:

1. The several appropriations of the waters of the Arkansas river complained of in said bill of complaint were made in accordance with and in reliance upon the doctrine respecting the appropriation of the water of the natural streams for irrigation and other beneficial uses which, by usage and custom prevailed in the arid region of the United States at the time of said appropriations, and which, by the recognition and approval of the United States, has at all times been the law applicable to the public lands in said arid region.

2. Prior to the acquisition of private title to any of the lands acquired by the General Government from France, Mexico and Texas by purchase, cession and annexation, respectively, comprising all the lands now within the jurisdiction of the United States between the Mississippi river and the Pacific coast, said General Government caused said lands to be explored and reported upon for the purpose of ascertaining the natural resources and the physical and climatic characteristics of the various portions thereof, and by said explorations and information obtained from time to time, it became known to the United States and the inhabitants thereof that from about the 98th meridian to the coast range of the Pacific slope, the land was an arid waste without timber or useful vegetation, except in the mountains, and that although the soil was rich and fertile, and great deposits of gold, silver and other valuable minerals existed therein, the soil could not be made productive nor the minerals ex-

tracted, nor could the land be inhabited, except by the diversion of water from the natural streams and the application thereof to agricultural and mining uses, and that in that portion of said domain which lay south of the Arkansas river, and which had formerly been a part of Mexico, the laws, customs and usages there prevailing authorized and sanctioned the diversion and use of water for agricultural and other useful purposes in contravention of any right of the riparian owner to have such water continually flow in its natural channel.

3. With the earliest settlement in said arid region for agricultural and mining purposes, which was long prior to the opening of said lands to pre-emption and purchase, by necessity, common consent and uniform practice, the doctrine obtained that the waters of all the natural streams flowing through said arid region were subject to diversion and use for agricultural and mining purposes, and that the right to the water thus diverted could be obtained both as against the United States as the owner of the public lands and all grantees of the United States of lands lying along said streams, and that the right of the several appropriators from any given stream should be in the order of diversion and use, the first in time being the first in right, and said doctrine has at all times been and now is the customary and statute law of said arid region in respect to the natural streams thereof.

With knowledge and in recognition of such right and custom of the inhabitants of such arid region to divert waters, and to apply the same to beneficial and necessary uses, the United States, in its treaty with Spain of February 22nd, 1819, and afterwards in its treaty of January 12th, 1828, with the united Mexican States, expressly stipulated and provided, that the use of the waters of the Arkansas river, and of certain other boundary streams, should be common to the respective inhabitants of both nations, parties to such treaties respectively.

4. Upon the creation and admission of the several Territories and States of said arid region, including Kansas, both as a Territory and State, they recognized approved and confirmed, and from thence hitherto have enforced said doctrine, and rights to water by diversion from the streams of said arid region have been maintained as against all claims of riparian rights in conflict therewith.

5. The Government of the United States, long prior to the sale by it of any of the public lands in the Arkansas valley, recognized and approved said doctrine, and applied the same to said public lands, and renounced and surrendered all riparian rights which it might have asserted in contravention of said doctrine, and from thence hitherto has held and disposed of said lands subject to and in accordance with said doctrine, and has at all times encouraged and promoted the diversion and use of the water of the streams in said arid region for agricultural and mining purposes, and by grants of public money has aided in the construction of canals, ditches and

reservoirs and other appliances for the diversion, storage and use of water, in the reclamation and cultivation of the public lands.

6. By an act of Congress, approved September 4, 1841, and by subsequent acts relating thereto, the public lands, including the lands in said arid region were declared subject to pre-emption and homestead purchase, and all persons desiring to avail themseves of the provisions of said acts were required to make a settlement upon the land in person and to inhabit and improve the same. It was then, and at all times since has been well known to the General Government, and particularly to Congress and the executive departments having in charge the administration of said acts, that the provisions thereof in respect to settlement, inhabitancy and improvement could not be complied with in the pre-emption and purchase of arid lands, except by the diversion of the waters of the streams upon the public lands and the application thereof to domestic and irrigation purposes in reliance upon the continuance of the right so to do in accordance with said doctrine of appropriation.

7. By means of the diversion and use of the waters of said natural streams, many million acres of the public lands in said arid region have been settled upon, inhabited and improved and title thereto obtained from the General Government, in the belief that by its action and conduct in the disposition of its public lands, the United States had accepted and applied to said public lands the doctrine of appropriation as hereinbefore set forth; and there has been paid to said General Government, on account of said lands so improved by the diversion and use of water in accordance with said doctrine, upwards of twenty million dollars, and all of the lands in the valley of the Arkansas in the State of Colorado, save and except certain Indian lands, were settled upon and patents therefor obtained by proof of the diversion and use of the waters of said Arkansas river in the reclamation and improvement of said lands, said diversions so made being those complained of and sought to be enjoined in and by the bill of complaint herein.

8. The Territory of Kansas by its legislature, recognized and approved the said doctrine of appropriation, and in pursuance thereof in 1859 authorized the St. Charles Town Company to divert the waters of the South Platte river and Cherry creek, and the Mountain Company to divert the waters of the Platte river, and the El Paso Town Company to divert the waters of the tributaries of the Arkansas river heading at Pike's Peak; and in 1860 authorized the Capital Hydraulic Company to divert for irrigation purposes all the waters of the South Platte river and Cherry creek. And the State of Kansas, by its legislature, has also recognized, approved and adopted said doctrine; an act of said legislature enacted in 1868 authorizing corporations to construct canals diverting water for irrigation purposes; an act of the legislature enacted in 1886 providing that the running waters of the State might be appropriated for purposes of irrigation; an act of said legislature enacted in 1891, providing that in all that portion of the State west of the 99th meridian

all natural waters, whether standing or running and whether surface or subterranean, should be devoted first, to purposes of irrigation in aid of agriculture, subject to ordinary domestic uses; and, second, to other industrial purposes, and might be diverted from natural beds, basins or channels for such purposes and uses; and another act enacted in 1895 providing for the development of the land west of the 98th meridian by irrigation and regulating the distribution of water in the same manner as in Colorado. Said State by said several acts renouncing and surrendering all rights it may have had in said river of the lands adjacent thereto as riparian owner in contravention of the right to divert the waters thereof for irrigation in Kansas or Colorado.

And in reliance upon the approval and adoption of said doctrine of appropriation by said State of Kansas, about five hundred miles of large canals and ditches have been constructed in Kansas, west of the 9th meridian at a cost approximating two million dollars and thereby the waters of said Arkansas river have been appropriated and applied to about one hundred and fifty thousand acres of land in the valley of said river, in the State of Kansas.

9. By the act of Congress approved January 29th, 1861, admitting Kansas into the Union, it was specifically provided that the State should never interfere with the primary disposal of the soil within the same by the United States, or with any regulations Congress might find necessary for securing the title in said soil to *bona fide* purchasers thereof, and that all laws of the United States not locally inapplicable should have the same force and effect within said State as in other States of the Union.

10. Following the admission into the Union of the State of Kansas, said doctrine of appropriation was further recognized by Congress as the law applicable to the public lands and the natural streams thereof, including those in the State of Kansas, by the following acts:

An act approved July 26, 1866, by which it was provided that whenever, by priority of possession, rights to the use of water for mining, manufacturing or other purposes, have accrued and are recognized according to local customs, laws and decisions, the owners and possessors shall be maintained and protected in their rights;

An act approved July 9, 1870, in which it was provided that all patents granted, or pre-emptions or homesteads allowed, should be subject to any vested and acquired water right or rights to ditches and reservoirs used in connection with such water rights;

An act approved March 3, 1877, known as "The Desert Land act," which declared that all waters of all lakes, reservoirs and other sources of supply upon the public land should remain and be held free for the appropriation and use of the public for irrigation, mining and manufacturing purposes, and in and by which it was also provided that by the construction of canals and ditches and the appli-

cation of said waters to the irrigation of the public lands, the title to said lands might thereby be obtained from the United States;

An act approved March 3, 1891, confirming the rights of way over the public lands in the arid region for canals and reservoirs for irrigation purposes;

An act approved August 18, 1894, providing for the conveyance to the several States in the arid region of such public lands as they might reclaim and irrigate;

An act approved June 17, 1902, authorizing and undertaking the construction of canals, ditches and reservoirs in the arid region, including therein the State of Colorado and the western portion of Kansas, whereby the waters of the public lands might be diverted and used for irrigation purposes, and appropriating for that purpose the proceeds of all moneys received from the sale of public lands in the State of Colorado and Kansas.

Under and by virtue of said act approved March 3, 1877, which was made applicable to lands in Colorado by an act approved March 3, 1891, several thousand acres of land in the Arkansas valley in the State of Colorado, were reclaimed and irrigated, and the diversions of water for said purposes are in part the diversions complained of in the said bill of complaint.

11. Said doctrine was further recognized by Congress by the appropriation, on October 2nd, 1888, of $229,000 for the purpose of investigating the extent to which the arid region of the United States might be redeemed by irrigation and for the segregation of the irrigable lands in such arid region, and for the selection of sites for reservoirs and other hydraulic works necessary for the storage and utilization of water for irrigation and also by a further appropriation made on March 2nd, 1889, of $450,000 for the like purpose, all of which moneys were expended in investigating and selecting reservoir sites and in running contour lines for the purpose of aiding and assisting those desiring to appropriate the waters of the natural streams and using the same for irrigating purposes.

12. The provisions of the constitution of the State of Colorado set forth and complained of in the bill of complaint, were adopted in harmony with and in pursuance of the policy of the United States in respect to the diversion and use of water in the irrigation of land, and the same do not conflict with or contravene any act of Congress bearing upon said appropriation and use, but, on the contrary, are intended as a constitutional guaranty that the right to divert water for beneficial purposes as authorized and encouraged by the acts of Congress referred to shall never be denied, and said provisions were accepted and approved by the action of Congress in admitting Colorado into the Union, and the several acts of the legislature of Colorado, referred to in said bill of complaint, have been enacted for the purpose of protecting and regulating appropriations made in pursuance of the usages and customs prevailing in the arid region and the rights of appropriation as recognized and confirmed by the acts of Congress referred to.

13. All grants and patents of land in the valley of the Arkansas, in the State of Kansas, were made by the United States, subject to the doctrine of appropriation heretofore set forth, and were accepted by the several grantees thereof with the knowledge that in the sale and disposition of the arid lands of the United States along said Arkansas river west of the 97th meridian, it had been and would be necessary to divert and use the waters of said river in the improvement and cultivation thereof, and said grants and patents of land in the State of Kansas were made subject to the right of all persons desiring the use of the same for agricultural purposes to appropriate the waters of the Arkansas river, either in Kansas or Colorado, to the full extent of said river, and all patents granted and all preemptions and homesteads allowed of lands in the valley of the Arkansas in the State of Kansas subsequent to July 9th, 1870, including in particular the lands described in the bill of complaint situated in Ford county, conveyed to said State of Kansas by the United States on the 13th day of June, 1889, and the lands in Reno county described in said bill of complaint conveyed to the said State of Kansas at divers times subsequent to said 9th day of July, 1870, were, by the act of Congress of July 9th, 1870, made subject to all water rights in said river and rights of ditches and reservoirs in connection therewith acquired in accordance with the local customs, laws and decisions of Colorado.

IV.

This defendant, for further answer to the bill of complaint, says:

1. Many of the appropriations of the waters of the Arkansas river, in the State of Colorado, complained of in said bill of complaint, were made prior to the creation of the Territory of Colorado and while said Arkansas valley was a part of the Territory of Kansas, and defendant is, therefore, unable to state the times at which said appropriations were made or the amount of water thus diverted from said river.

2. Following the creation of the Territory of Colorado and prior to the year 1865, sixty-eight ditches and canals were constructed, and 615 cubic feet of water per second of time were thereby diverted from said river and its tributaries, and have at all times since been used in the irrigation of land in said Arkansas valley. From and including the year 1865 to the year 1870, 127 additional ditches and canals were constructed, and 458 cubic feet of water per second of time were thereby diverted from said river, and at all times since have been continuously used in the irrigation of lands in said valley. From and including the year 1870 to the year 1880, 268 additional ditches and canals were constructed and 945 cubic feet of water per second of time thereby diverted, and at all times since used in the irrigation of land in said valley. From and including the year 1880 to the year 1890, 250 additional ditches and canals were constructed, and 3,859 cubic feet of water per second of time thereby

diverted from said river, and at all times since continuously used when obtainable in the irrigation of land in said valley. All of said ditches and canals have been constructed by individuals and corporations, and the water, when obtainable, has been taken from said river and applied to the reclamation and irrigation of about five hundred thousand acres of land in said valley which, before said diversion and use, was arid and incapable of producing crops, all of said lands being in the watershed of and riparian to said river, and none of the waters of said river being diverted and carried to lands beyond the watershed of said river.

3. In the construction of said canals and ditches and the reservoirs connected therewith, many million dollars have been expended, and in the lands irrigated by means of said ditches and canals, and in the improvements thereon and the machinery used in the cultivation thereof more than twenty-five million dollars have been invested. Numerous towns and villages have grown up in said valley in the State of Colorado, having as an aggregate population more than one hundred thousand, and houses, stores, churches, school houses, factories and public and private buildings for various purposes have been constructed for occupation and use, and actually used in connection with the continued settlement and cultivation of the lands in said valley by the use of the waters of said Arkansas river, the amount so invested aggregating many million dollars.

4. In 1879 and 1881 the legislature of Colorado enacted certain statutes providing for the adjudication of rights to water by appropriation for agricultural uses from the streams in said State, under and by virtue of which irrigation districts were created along the entire length of the Arkansas river in said State, and proceedings were thereupon had in each of said districts in which the owners of ditches and canals taking water from said Arkansas river and its tributaries were parties, and in which the amount of water to which each ditch or canal was entitled was ascertained and decreed. In said proceedings the owners of 713 ditches and canals were parties, and decrees were entered finding the various amounts of water that had been appropriated from said river and its tributaries, and applied to beneficial uses in the irrigation of said lands in said valley, and the dates of said appropriations. In said adjudications many thousand dollars were expended in costs, attorney fees and other necessary expenses in the belief that by said decrees the right of each appropriator, in the order of his appropriation, to the waters of said river had been established as a perpetual property right.

5. The State of Kansas and the inhabitants thereof, well knew that, commencing in said State at about the 98th meredian, and thence continuing westward to the Rocky mountains, the land was arid and incapable of being settled upon or cultivated, except by the diversion and use of the waters of the natural streams, and that diversions of the waters of the Arkansas river were being made at the times and in the amounts and for the purpose hereinbefore set forth, and that such diversions were made under a claim of right

to the continued use of the waters of said river as against all owners of land in the valley of the Arkansas throughout its entire length, and that the settlement of said valley in the State of Colorado and the expenditure of the amounts hereinbefore stated, and the construction of canals, ditches and reservoirs, and in lands, buildings and improvements, and in houses, stores, factories, and public and private buildings, was made in reliance apon the right to divert the waters of said river and to continue such diversion in perpetuity.

6. Prior to the filing of the bill of complaint herein, neither the State of Kansas, nor the owners of lands in the Arkansas valley in said State, complained of said diversions, nor the right to make or continue the same, nor in any way or manner claimed or alleged any right upon the part of said State, or the owners of land in said valley, to the flow of said river as it had been accustomed to flow prior to the making of said appropriations; but, on the contrary, the said State approved the diversion of water from said river and affirmed the right to make the same in the reclamation and irrigation of the lands along said river, by an act of the legislature of said State, enacted in 1886, authorizing and providing for the like diversion and use of the waters of said river in the State of Kansas, and by a further act, enacted in 1891, declaring that in that portion of the State of Kansas west of the 99th meridian all natural waters, whether running or standing, and whether surface or subterranean, should be devoted, first, to the purposes of irrigation in aid of agriculture; and, second, to other industrial purposes, and that said waters might be diverted from natural beds and channels for such purposes and use, and the owners of land in said valley in said State recognized and approved said appropriations, and the right to continue the same, by themselves constructing about five hundred miles of canals and ditches, and diverting the waters of said river for the irrigation of about one hundred and fifty thousand acres of land, and claimed the right so to do as against all owners of lands along the course of said river in Kansas or elsewhere.

7. The said State of Kansas and the owners of land in the valley of the Arkansas, in said State, have at all times acquiesced in the appropriation of the waters of the Arkansas river in the State of Colorado, and have waived, surrendered and relinquished any and all riparian rights now claimed by them, and by their delay in the filing of the complaint herein have caused the several appropriators of water from said river in Colorado to make the expenditures hereinbefore mentioned, and the people in said valley to settle upon, improve and cultivate the lands, and to build towns and cities, and for that purpose to expend the sums hereinbefore mentioned; and they are now estopped, by their conduct and delay, from asserting or maintaining any of the rights claimed in the said bill of complaint, and each and every owner of land in said valley in the State of Kansas who might claim rights adverse to the appropriations of water from said river in Colorado, are by the statutes of said State of Kansas barred from asserting such rights as against ditches and

canals constructed and appropriations made in the State of Colorado fifteen years or more prior to the filing of the bill herein.

8. Upon information and belief, this defendant avers that the owners of land adjoining said Arkansas river in the State of Kansas west of the 98th meridian have refused to assert or maintain any right to the flow of said river as against the right to divert and apply the same to agricultural and other beneficial uses in the States of Colorado and Kansas, and have refused to authorize or encourage this or any other proceeding by the State of Kansas based upon their alleged rights as riparian owners and designed to destroy or impair the right to use the waters of said river for irrigation and other beneficial purposes as now practiced in the State of Colorado and in the State of Kansas west of the 98th meridian.

9. This defendant, in making the allegations set forth in this its further and separate answer, disclaims any right to represent or act for any of the persons or corporations diverting water from the Arkansas river, but makes such allegations for the purpose of bringing to the knowledge of the court the fact that in ascertaining and adjudging the rights of the several persons and corporations diverting water in Colorado, it will be necessary to make parties to this proceeding the owners of lands in Kansas in whose behalf, in part, it is claimed this proceeding was instituted.

V.

This defendant, for further separate answer to the bill of complaint, says:

1. The Arkansas river leaves the foot hills of the Rocky mountains at an elevation of about six thousand feet above sea level, and thence flows eastward over an elevated plateau known as the "Great plains" for several hundred miles, with a practically uniform descent to the east, passing into the State of Kansas at an elevation of 3,350 feet into the Territory of Oklahoma at an elevation of 1,000 feet. Through Colorado and Kansas it has a broad, level bed of sand, seldom entirely covered with water, the ordinary flow running in thin sheets in tortuous and constantly changing channels in the river bed. From the mountains, for four hundred miles eastward, the water-shed of said river is naturally barren, treeless and without any vegetation, except the short sparse grass common to the Great plains. The annual precipitation of moisture is about fourteen inches, most of which falls in local and violent storms. In its uncultivated condition, the land rapidly sheds the rainfall, discharges it into the river and prevents the saturation of the soil and the formation of springs by which said river and the tributaries along its course might be fed. The tributary streams are usually dry, carrying and discharging water into the river only in case of storms. The sun is seldom obscured, and commencing near the State line between Colorado and Kansas, and continuing eastward for at least two hundred miles, the winds are dry and constant, in the summer

season becoming so heated as to burn and destroy the vegetation and to absorb such water as may be in the bed of said river. The waters supplied to said river for about four hundred miles of its course after leaving the mountains are irregular in discharge and constantly varying in quantity, and are not sufficient to cause a steady and permanent flow during any season of the year. The main supply of the ordinary flow of that part of the river above described is from the snows and storms in the mountains. As the snow melts only during warm days, this supply is also irregular and uncertain, and the volume of water in the river, therefore, changes daily and even hourly. Long before irrigation was practiced in Colorado, it was observed that as the waters from the mountains flowed eastward, the volume constantly diminished, and this diminution was the more marked as the river passed beyond the area of local storms caused by the mountains. During the summer season, except when flooded by violent showers, the river, at a distance of from two hundred to four hundred miles from the mountains, would show no surface water other than occasional pools in the sand, and none of the water coming into said river in Colorado would flow to or across the lands in the central or humid portion of Kansas. The ordinary flow of said river in Kansas has been still further diminished by the destruction of timber on the watershed of said river in the mountains and by the extension westward of the cultivated area of lands in Kansas and by the sinking in western Kansas of upwards of one thousand wells contiguous to said river, and the pumping and use of the waters thus obtained upon the adjoining land.

2. All of the canals, ditches and reservoirs in Colorado complained of in said bill of complaint have their headgates within one hundred and fifty miles of the mountains, and the waters diverted into said canals and ditches are the waters, which, if not so diverted, would be lost by seepage and evaporation long before reaching the lands in Kansas claimed to be injured by such diversion.

3. The waters of the Arkansas river diverted in Colorado are those which fall within the watershed of said river in said State, and they are diverted and used only upon such lands within said watershed as need the same for domestic and irrigation purposes, and all the said lands upon which said waters are used are lands entitled to the same as the riparian lands of said river.

4. By the practice of irrigation in the valley of the Arkansas in Colorado, the flow of said river in the State of Kansas, outside the flood periods, is increased, instead of diminished. A great part of the land lying between the foothills of the mountains and the State line, and extending several miles back from the river on each side, which, in its natural condition is devoid of moisture, as alleged in the bill of complaint, becomes saturated, irrigation producing a condition the same as that produced by abundant rainfall. Water veins and channels are created in the land, springs break out and the water seeking a lower level, continually exudes into the nearest dry channels coursing the country, making them perennial streams discharg-

ing water into the river. The storm and flood waters of the river are stored in large quantities and during the irrigating season are added to the water diverted directly from the river and applied to the land, thus serving to convert the flood waters of the river into an additional source of supply for the river during its lowest natural stages. As the irrigated area has moved eastward, the return and seepage waters from the lands irrigated have materially increased the flow of the river and water now flows continuously in said river at many points where, at low stages of the river, it was not accustomed to flow prior to the development of irrigation systems in Colorado.

This defendant, now having fully answered all the allegations in the plaintiff's amended bill of complaint, or so much thereof as the defendant is advised should be answered, asks to be hence dismissed with cost and charges in this behalf sustained.

N. C. MILLER,
Attorney General of Colorado and
Solicitor for Defendant.

EDWD. O. WOLCOTT,
JOEL F. VAILE,
CHARLES D. HAYT,
PLATT ROGERS,
C. W. WATERMAN,
F. E. GREGG,
CLYDE C. DAWSON,
Of Counsel.

[Endorsed:] Supreme Court U. S., October term, 1903. Term No. 7, original. The State of Kansas, complainant, vs. The State of Colorado *et al.* Answer of the State of Colorado to the amended bill of complaint. Filed Oct. 14, 1903.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL., Defendants. } Original Proceeding, No. 7.

Separate Answer of The Graham Ditch Company, Defendant.

Charles C. Goodale, solicitor for the Graham Ditch Company.

In the Supreme Court of the United States

To the honorable the Chief Justice and the associate justices of the Supreme Court of the United States:

The answer of The Graham Ditch Company, a corporation organized and existing under the laws of the State of Colorado, and whose post-office address and principal place of business is Lamar, State of Colorado, one of the defendants to the amended bill of complaint of the State of Kansas, complainant.

This defendant, now and at all times hereafter saving and reserving unto itself all benefit and advantage of exception which can or may be had or taken to the many errors, uncertainties and other imperfections in the said bill contained, for answer thereunto, or to so much and such parts thereof as this defendant is advised it is material or necessary for it to make answer unto, answering separately says:

1. This defendant admits that the State of Kansas and the State of Colorado, respectively, were admitted into the Union at the dates set forth in the amended bill, and that the original bill in this proceeding and the amended bill were and are exhibited and the proceedings in reference thereto have been and are being prosecuted as in the bill alleged, and admits that the rise, course, drainage, area and general physical characteristics of the Arkansas river and of the valley thereof, except as hereinafter set forth, are as stated in the said amended bill of complaint.

2. This defendant denies that the said Arkansas river, after leaving the mountains, is a navigable stream under the laws and departmental rules and regulations of the United States. This defendant admits that the lands bordering on the Arkansas river and its tributaries in the State of Colorado, as to that part thereof situated within the Rocky mountains and in the foothills at the eastern base thereof, are of such a character that they are not saturated to an appreciable extent by the waters flowing in said river or its tributaries, but denies that said lands herein mentioned are arid or barren up to the margin of said streams, or at all, but, on the contrary, alleges that there has in the past been, and to a certain extent now is, a growth of timber and other vegetation thereon, and

this defendant alleges that from the foothills on the eastern base of the said Rocky mountains and thence to the eastern boundary of the State of Colorado, the said lands bordering upon the Arkansas river and its tributaries in the State of Colorado are of like character to the lands in the western one hundred and fifty miles of the State of Kansas, and that the same are of like physical characteristics.

3. This defendant denies that any diminution of the flow of said river from the State of Colorado into the State of Kansas is wholly or mainly attributable to the diversion of the waters of said stream in the State of Colorado, and denies that there has been any wrongful diversion of said waters within the State of Colorado. This defendant denies that the normal flow of said river at the State line for ten months in the year, or for any considerable period, is upwards of two thousand cubic feet per second, and, on the contrary, alleges that in the absence of any irrigation in the State of Colorado, or any diversion of the waters of said stream in said State, the normal flow, exclusive of periods of flood, would not at the said State line exceed five hundred cubic feet per second of time. This defendant denies that the tributaries of said river in the State of Kansas are few in number, or that the same do not or could not furnish water sufficient to cause a continuous stream to flow in the bed of said river as to that portion of said stream east of the 99th meridian (west of Greenwich) and this defendant alleges that east of said 99th meridian there are many streams of water tributary to and furnishing a large supply of water to said Arkansas river, and in this connection this defendant alleges that the said Arkansas river, within the State of Kansas, drains an area of more than twenty thousand square miles, and that in the eastern half of the course of said river within said State there is ample rainfall sufficient in itself to create and continue a large stream of water. This defendant admits that the rainfall in the drainage area of said river in the western part of the State of Kansas is light and by reason of the porous nature of the soil through a considerable portion of the western part of said State, a part of the water so falling sinks into the earth, but this defendant denies that only a small portion thereof finds its way to said river, and on information and belief alleges that substantially all thereof, by drainage or by seepage, ultimately supplies the flow of water in the channel of said stream. This defendant denies that the ordinary and usual rainfall in that part of the valley of said river lying east of the 98th meridian is inadequate for the growing and maturing of cultivated crops, but admits that in the western part of the said State of Kansas such rainfall is inadequate for so growing and maturing cultivated crops, and alleges that in the portions of said State so affected the inhabitants thereof have resorted to and are now daily practicing the method of appropriation of water from said Arkansas river, and using the same for the irrigation of lands, in the same manner as in the said bill of complaint is alleged to be done in the State of Colorado.

4. This defendant denies that from time immemorial, or at all, the waters of said river have flowed through underlying sand and gravel

extending in width under the entire valley of the Arkansas river through the State of Kansas, or for any material portion thereof, and denies that any part of the course and flow of said river is beneath the surface of the bottom lands of the valley of said river, or that the course or flow thereof is of any greater width than the channel of said river between its banks, or that there is any under-flow of water co-extensive with the valley of said river passing from the State of Colorado into the State of Kansas, or in, or through said State of Kansas. This defendant admits that there are underground waters in the valley of the said Arkansas river outside of and away from the channel of said stream, but on information and belief alleges the same to be the ordinary water table of the country, and that the same does not constitute an under-flow of the said Arkansas river, and this defendant denies that as to such underground waters designated in the complaint as an "under-flow" that there is any difference whatsoever between the State of Colorado east of the foothills and the said State of Kansas, but alleges that there is a similarity of physical characteristics in that respect in the valley of the Arkansas river both east and west of the boundary line separating said States. This defendant denies that such under-ground water, whether called "under-flow" or otherwise, furnishes sufficient moisture to grow ordinary farming crops in the absence of rainfall, unless the same be supplemented by a system of irrigation such as is used in the State of Colorado and in the western part of Kansas. This defendant, upon information and belief, denies that the evaporation from said river, to any appreciable extent or material degree, tends to cool or moisten the surrounding atmosphere, or promote the growth of vegetation, or enhance the value of lands, or conduce directly or materially or at all to the public health or the making of the locality habitable. This defendant admits that evaporation from said stream is rapid and great, and that it is greater at the west line of the State of Kansas than it is at points farther east, and in this connection this defendant alleges that such evaporation is yet greater in the State of Colorado between the point where said river leaves the foothills and the point where it crosses the boundary between Kansas and Colorado, and this defendant alleges that under the system of irrigation used in the State of Colorado the injury, if any, resulting to the inhabitants of the State of Kansas through the loss of water by evaporation is less than it would be if there were no such irrigation system in use within the State of Colorado.

This defendant admits that in the western half of the State of Kansas are many acres of arid upland and plateau bearing grass upon which cattle may feed, and that the cattle so fed must have watering places, and this defendant alleges that the number of such watering places in western Kansas has not been diminished, but, on the contrary, has been increased by the methods of irrigation used in the State of Colorado, and especially through the effect of return waters in times when otherwise there would be small flow in the channel of said river, as hereinafter more specifically set forth.

This defendant admits that if the surface flow of water in the bed of said river should be "wholly" cut off from the State of Kansas, that the underground waters under the adjacent bottom lands called in the bill of complaint "under-flow" would diminish, but, upon information and belief, this defendant alleges that such diminution would result only because of the increased drainage resulting from such process, but this defendant alleges that the system of irrigation practiced in the State of Colorado has not had the effect, and never can have the effect of wholly or materially cutting off from the State of Kansas a surface flow of water in the bed of said river, and, on the contrary, alleges that said irrigation system equalizes the flow of said river in the channel thereof through the State of Kansas, diminishing the volume of flood water and increasing the supply in periods of comparative drought.

5. This defendant admits that that part of the bottom lands of the river lying east of the 98th meridian (west of Greenwich) including those adjacent to the bed of said river are fertile and productive and adapted to the growth of crops mentioned in the bill, and that said lands are valuable for grazing, but this defendant denies that in the western part of the State of Kansas said bottom lands are fertile or productive or valuable for farming purposes or adapted to the growing of corn, wheat, alfalfa, rye, domestic grasses, orchards, fruits, vegetables, or like crops, grains or grasses, except by the aid of irrigation and by the diversion and appropriation of water from the said Arkansas river, which said diversion and appropriation of water is, under the sanction of the laws of the State of Kansas as hereinafter set forth, practiced by the inhabitants of that portion of the State of Kansas west of the 98th meridian aforesaid.

6. Whether or not the actual value of the bottom lands in the valley of the Arkansas river in the State of Kansas is the value set up in the bill of complaint, this defendant has not, and cannot obtain, sufficient information upon which to base a belief, but this defendant denies that the value of said lands is in any degree dependent upon the said lands being permitted to receive the benefits arising from the natural and normal flow of water in said river, and denies that the acts alleged to have been done by this defendant are wrongful, and this defendant denies that by reason of the alleged wrongs in the said bill of complaint set forth, or otherwise, the value of said lands has shrunk many millions of dollars, or in any sum whatsoever, so far as such value is dependent upon the use of the waters of said Arkansas river, and denies that the said alleged wrongs have resulted in a loss to the citizens of the State of Kansas, or to the taxable wealth, or to the revenue of said State, or to the school system thereof, in any amount or extent whatsoever.

7. This defendant admits the acquisition by the State of Kansas of sections numbered 16 and 36 of each governmental township, and admits the derivation of title to certain alternate sections of land to aid in the construction of certain railroad and telegraph lines in said State as in the bill of complaint set forth, and that the said lands

have been conveyed and are now held by the grantees thereof, and this defendant admits the settlement of certain of the lands in the said State of Kansas in the Arkansas valley from the south line of the State of Kansas to the city of Great Bend, and subsequently the settlement of certain lands from Great Bend westward to the State line of the State of Kansas, and that the settlers thereon and their successors in interest have continuously held and owned all of the riparian and other rights of every kind and nature appertaining to or belonging to said lands, but this defendant alleges that such "riparian and other rights" so held by said settlers and their successors in interest were at all times and now are subject to the riparian rights of other proprietors of lands in the valley of the Arkansas higher up said stream, and subject also to the right of the inhabitants in the valley of said Arkansas river and those who shouldfrom time to time become inhabitants therein to appropriate the waters of said stream and use the same in the irrigation of lands within the valley of the Arkansas river through any portion of its course, as hereinafter more specifically set forth.

8. This defendant denies that all of the territory of the State of Kansas became a part of the territory of the United States by the treaty with the French Republic of April 30th, 1803, ceding Louisiana, and, on the contrary, alleges that all that portion of the said State of Kansas lying west of the 100th meridian (west of Greenwich) and south of the Arkansas river was never derived under said treaty and that said portion of said State never belonged to the French Republic, and in that behalf this defendant alleges that the said portion of said territory, being that portion of Kansas adjoining the State of Colorado, and on the south side of the Arkansas river, was derived by the United States from the Republic of Texas, which in turn succeeded in sovereignty over said territory to the united Mexican States. This defendant again denies that the said Arkansas river is now, or at any time has been, a navigable river in the State of Kansas or that it has at any time been treated as such, or that the title to the bed of said river in the State of Kansas ever passed to said State, or that said State is now or ever has been the owner thereof, or entitled to the control thereof, or has ever attempted to control the same, save and except that as a political organization it has sovereignty over the same, or that it has ever assumed to exercise any authority over said river or the bed thereof, except as by an act of the legislature of the State of Kansas passed in 1886, it declared that the right to the use of running water flowing in a river or stream of Kansas for the purpose of irrigation might be acquired by appropriation, and by a like act passed in 1891 it declared that in that portion of the State west of the 99th meridian all natural waters standing or running should be devoted—first, to purposes of irrigation in aid of agriculture, subject to ordinary domestic uses; and secondly, to other industrial uses, and that the same might be diverted from the natural beds, basins or channels for such purposes and uses, and by like acts subsequently passed it has enlarged and

extended the right to use the natural waters of said State for irrigation purposes, eastward to the 98th meridian.

9. This defendant has no knowledge of the several conveyances or grants of lands in the valley of the Arkansas river in the State of Kansas heretofore made by the Government of the United States, but avers that all of the conveyances or grants referred to in said bill of complaint were made subject to all rights to water from said river for irrigation purposes theretofore, and thereafter to be acquired, and were taken with full knowledge on the part of said State of Kansas and by each and every grantee of said lands that the waters of said river had been, were being and would be appropriated in the State of Colorado for beneficial uses in the irrigation of land, and that the lands in said valley in the State of Kansas west of the 98th meridian and in the State of Colorado could only be made available for agricultural purposes by like appropriation and use, and that the Government of the United States as the primary owner of said lands had assumed that it held the same subject to the appropriation of the waters of said river for irrigation purposes, and that all patents of lands granted after July 9th, 1870, should be subject to all vested and accrued water rights over said river.

10. As to that certain tract of land described in paragraph 5 of plaintiff's bill, consisting of lots numbered 3, 5, 6 and 7 of section 3, township 27 south, of range 24 west, in Ford county, Kansas, alleged to be used for the maintenance of a soldiers' home, this defendant alleges upon information and belief that the said State of Kansas as a proprietor of said lands has not made and does not now make any beneficial use of the waters flowing in the channel of the said Arkansas river for the improvement of said lands or the maintenance of said soldiers' home, and this defendant denies that the value of said lands for farming purposes depends upon the flow of water in the bed of the river or upon the so-called under-flow beneath the said land, and under the circumstances and conditions of the use of said water this defendant denies that the said State of Kansas is entitled to the full, free and natural flow of all waters which naturally would flow in said river to or beneath said land, and denies that the rights of the State of Kansas thereto are prior or superior to the rights or claims of this defendant or of the inhabitants of the State of Colorado, so far as pertains to the waters of the said Arkansas river.

11. As to those certain lands described in paragraph 6 of the complainant's bill as being in sections 18 and 19, township 23 south, of range 5 west of the sixth principal meridian in Reno county, Kansas, and designated as reformatory lands, this defendant alleges upon information and belief that the said State of Kansas as the proprietor of said lands has never made any beneficial use of the waters of the Arkansas river flowing by or near said lands, and this defendant denies that, under the circumstances and conditions affecting the said Arkansas river and the waters thereof, the said State of Kansas is entitled to the full and natural flow of the water of the Arkansas river in its accustomed place or at its normal

height or in its natural volume underneath or by the said reformatory lands, and denies that the rights of the said State of Kansas are prior or superior to the rights of this defendant or of the inhabitants of the said State of Colorado in the waters of said Arkansas river.

12. This defendant denies that the legislature of the State of Colorado has passed laws authorizing or licensing the diversion of water from said Arkansas river, or has granted to any person, firm or corporation the right or authority to make such diversion, but, on the contrary, avers that said legislature has at all times recognized the right to make such diversion as one existing independent of any action by it and as one founded on necessity and on the usages and customs of the arid region of the United States existing prior to the adoption of the constitution of the State of Colorado, and approved and confirmed by the statutes, decisions and rulings of the legislative, judicial and executive departments of the United States, and said legislature has never assumed the power to either grant or restrain the right to divert the waters of the Arkansas river for irrigation or other purposes or to do more with respect to such diversions than to regulate and to control the same by appropriate legislation.

And this defendant denies that as a result of the exercise of the rights alleged in the amended bill to be claimed by the State of Colorado all of the waters of the said Arkansas river are forever lost to said stream and are thereby prevented from flowing into and through the State of Kansas, and, on the contrary, alleges that as a result of the irrigation systems in vogue in the State of Colorado and by the storage and return of waters through such irrigation systems, all the surplus of such waters not actually consumed in the supply of vegetation is returned to the said Arkansas river and flows down into and through the State of Kansas, and the flow of the said Arkansas river in the State of Kansas is thereby equalized, the dangers from flood diminished and the supply of water in times of comparative drought increased.

And this defendant further alleges that the allegation as to the appropriations of water from the Arkansas river stated to be 4,200 cubic feet per second from the said river, and from the affluents and tributaries thereof 4,300 cubic feet per second, does not represent the actual diversion of said waters, or the diminution of the volume of water flowing in the channel of said river; that waters returned to the channel of the stream from ditches farthest up the stream are again taken out by ditches lower down on the stream, and that to a large extent the same water is repeatedly used in successive ditches, and this defendant denies that as a result of such appropriations, or otherwise, the total average flow of the said Arkansas river or the total average flow of its affluents and tributaries is taken out, used or absorbed as in the bill of complaint alleged, and denies that any considerable portion of the ordinary flow of said Arkansas river is prevented from passing into the State of Kansas, and, on the contrary, alleges that the major part of the aggregate amount of water

derived from the channel of the said Arkansas river in the State of Colorado, by drainage, seepage and return waters, again enters the said stream and the channel thereof and continues to flow into and through the State of Kansas.

13. This defendant admits that ditch owners are diverting from the natural channel the waters flowing in the bed of the Arkansas river and its tributaries in the State of Colorado, but denies that they are carrying said waters great distances from their natural courses or discharging them upon non-riparian lands in the sense in which the word "riparian" is used in the assertion of the complainant's claims, and this defendant alleges that all of the waters diverted from the channel of the Arkansas river in the State of Colorado are used, and used solely, within the valley of the Arkansas river, and while the same are discharged for agricultural purposes upon arid lands, such lands are valley lands in the drainage of the said Arkansas river, and this defendant alleges that the waters so diverted, after being used upon the lands so lying in the valley of the Arkansas, are returned to said channel, diminished only to such extent as is necessary and inevitable from the use of the same for agricultural purposes, and this defendant denies that such waters are wholly lost to such streams, or to the State of Kansas, or to its inhabitants, or that such diversion is carried to such an extent that no water flows in the bed of said river from the State of Colorado to the State of Kansas during the annual growing season or that the so-called under-flow of water in Kansas is thereby diminished, and, on the contrary, this defendant alleges as heretofore stated that the return waters from such systems of irrigation again enter the channel of the said river, and that the same do flow into the State of Kansas and through the said State, and this defendant denies that by the diversion of water from the said river in the State of Colorado the bottom lands of said river have become or will become injured, ruined or deserted.

14. This defendant denies that the State of Colorado or the corporations joined with it as defendants in this cause claim or openly assert their right or power to do as they please with all of the waters of the Arkansas river within the borders of Colorado regardless of any rights which the State of Kansas or its citizens may have therein, but this defendant, and, as this defendant is advised, the corporations associated with it as defendants herein, do claim and assert that they have the right and power to apply the water of the Arkansas river within the borders of Colorado to beneficial and necessary uses for the development of the country and the support of the inhabitants thereof upon those lands situated within the valley and drainage of the Arkansas river, returning the said waters after such use and to the extent of any surplus remaining from such use into the channel of the Arkansas river.

15. This defendant denies that when the Territory of Kansas was created or the State of Kansas admitted to the Union, the water of said Arkansas river was wholly unappropriated, or that the common

law as to riparian rights, as claimed in said amended bill of complaint, extended over said valley in the Territory of Kansas, or that the owners of lands along said river were entitled to the unimpeded flow of the water of said river, and, on the contrary, avers that numerous appropriations of said water had been made for irrigation purposes long prior to the creation of said Territory, and many more were made prior to the conveyance by the Government of the United States of any of the lands lying along or adjacent to said river, and that the necessity and right to divert the water of said river for the reclamation of arid land had long previous to the creation of said Territory been asserted and exercised by the persons in possession of said lands, and said necessity and right were thereafter recognized by the legislature of the Territory of Kansas, and all lands along said river acquired by the State of Kansas or by individuals or corporations within the Territory or State of Kansas were taken and held with full knowledge of the necessity of diverting the water of said river for the purpose of reclaiming and making productive the lands along said river and of the usages and customs there prevailing authorizing the same, and that appropriations had been, were being and would be made in that portion of the valley which is now within the jurisdiction of the State of Colorado, and that to the extent of said appropriations the flow of water of said river might by said usages and customs be lawfully impeded for the purpose of applying the same to beneficial uses within the valley of said Arkansas river.

16. This defendant denies that by its taking of water from said river in the State of Colorado in the manner alleged in said bill of complaint the State of Kansas, or any of its citizens, or the owners of land along said river in the State of Kansas, have been injured in any degree whatever, or that the fertility of the lands or the use thereof to the fullest extent to which the same is naturally capable of use, have been diminished or impaired, or that the crops, trees or vegetation growing along said river have perished or will perish, or that the wells have become or will become dry, or that the salubrity or healthfulness of said valley or any of the lands adjacent to said river have been or will be impaired.

And this defendant denies that by reason of the diversion of said waters as in the complaint alleged during the summer season or during the dry portion of the year, the bed of said river in the State of Kansas above the city of Wichita becomes practically or oftentimes wholly dry, and this defendant alleges that if in said portion of the said State of Kansas the bed of said stream and the natural channel thereof is becoming filled with drifting sand, dirt or debris, and said obstructions are rapidly becoming permanent by growing vegetation, and if at the time of sudden and excessive rainfall in the State of Kansas and of sudden and excessive melting of snows in the State of Colorado the flow of the waters thereof can not flow down the natural channel of said river, so filled as aforesaid, but travel the adjacent bottom lands, washing channels therethrough

and depositing dirt and debris thereon and doing great damage to stock pastures, crops grown or improvements situated thereon, and injuring or decreasing the value of said lands, such effects are not attributable in any degree whatsoever to the irrigation system within the State of Colorado, but the same are attributable to and fully explained by other causes not connected with the diversion and appropriation and use of water for irrigation purposes in the State of Colorado, and this defendant alleges that the evils so alleged to exist are diminished rather than intensified by the existence of said irrigation systems within the State of Colorado.

II.

This defendant for further answer to the bill of complaint, says:

1. The appropriation of this defendant hereinafter referred to of the waters of the Arkansas river complained of in said bill of complaint were made in accordance with and in reliance upon the doctrine respecting the appropriation of the water of the natural streams for irrigation and other beneficial uses which, by usage and custom prevailed in the arid region of the United States at the time of said appropriations, and which, by the recognition and approval of the United States, has at all times been the law applicable to the public lands in said arid region.

2. Prior to the acquisition of private title to any of the lands acquired by the General Government from France, Mexico and Texas by purchase, cession and annexation, respectively, comprising all the lands now within the jurisdiction of the United States between the Mississippi river and the Pacific coast, said General Government caused said lands to be explored and reported upon for the purpose of ascertaining the natural resources and the physical and climatic characteristics of the various portions thereof, and by said explorations and information obtained from time to time, it became known to the United States and the inhabitants thereof that from about the 97th meridian to the coast range of the Pacific slope, the land was an arid waste without timber or useful vegetation, except in the mountains, and that although the soil was rich and fertile, and great deposits of gold, silver and other valuable minerals existed therein, the soil could not be made productive nor the minerals extracted, nor could the land be inhabited, except by the diversion of water from the natural streams and the application thereof to agricultural and mining uses, and that in that portion of said domain which lay south of the Arkansas river, and which had formerly been a part of Mexico, the laws, customs and usages there prevailing authorized and sanctioned the diversion and use of water for agricultural and other useful purposes in contravention of any right of the riparian owner to have such water continually flow in its natural channel.

3. With the earliest settlement in said arid region for agricultural and mining purposes, which was long prior to the opening of said

lands to pre-emption and purchase, by necessity, common consent and uniform practice, the doctrine obtained that the waters of all the natural streams flowing through said arid region were subject to diversion and use for agricultural and mining purposes, and that the right to the water thus diverted could be obtained both as against the United States as the owner of the public lands and all grantees of the United States of lands lying along said streams, and that the right of the several appropriators from any given stream should be in the order of diversion and use, the first in time being first in right, and said doctrine has at all times been and now is the customary and statute law of said arid region in respect to the natural streams thereof.

With knowledge and in recognition of such right and custom of the inhabitants of such arid region to divert waters, and to apply the same to beneficial and necessary uses the United States, in its treaty with Spain of February 22nd, 1819, and afterwards in its treaty of January 12th, 1828, with the United Mexican States, expressly stipulated and provided, that the use of the waters of the Arkansas river, and of certain other boundary streams, should be common to the respective inhabitants of both nations, parties to such treaties respectively.

4. Upon the creation and admission of the several Territories and States of said arid region, including Kansas, both as a Territory and State, they recognized, approved and confirmed, and from thence hitherto have enforced said doctrine, and rights to water by diversion from the streams of said arid region have been maintained as against all claims of riparian rights in conflict therewith.

5. The Government of the United States, long prior to the sale by it of any of the public lands in the Arkansas valley, recognized and approved said doctrine, and applied the same to said public lands, and renounced and surrendered all riparian rights which it might have asserted in contravention of said doctrine, and from thence hitherto has held and disposed of said lands subject to and in accordance with said doctrine, and has at all times encouraged and promoted the diversion and use of the water of the streams in said arid region for agricultural and mining purposes, and by grants of public money has aided in the construction of canals, ditches and reservoirs and other appliances for the diversion, storage and use of water, in the reclamation and cultivation of the public lands.

6. By an act of Congress, approved September 4, 1841, and by subsequent acts relating thereto, the public lands, including the lands in said arid region were declared subject to pre-emption and homestead purchase, and all persons desiring to avail themselves of the provisions of said acts were required to make a settlement upon the land in person and to inhabit and improve the same. It was then, and at all times since has been well known to the General Government, and particularly to Congress and the executive departments having in charge the administration of said acts, that the provisions

thereof in respect to settlement, inhabitancy and improvement could not be complied with in the pre-emption and purchase of arid lands, except by the diversion of the waters of the streams upon the public lands and the application thereof to domestic and irrigation purposes in reliance upon the continuance of the right so to do in accordance with said doctrine of appropriation.

7. By means of the diversion and use of the waters of said natural streams, many million acres of the public lands in said arid region have been settled upon, inhabited and improved and title thereto obtained from the General Government, in the belief that by its action and conduct in the disposition of its public lands, the United States had accepted and applied to said public lands the doctrine of appropriation as hereinbefore set forth; and there has been paid to said General Government, on account of said lands so improved by the diversion and use of water in accordance with said doctrine, upwards of twenty million dollars, and all of the lands in the valley of the Arkansas in the State of Colorado, save and except certain Indian lands, were settled upon and patents therefor obtained by proof of the diversion and use of the waters of said Arkansas river in the reclamation and improvement of said lands, said diversions so made being those complained of and sought to be enjoined in and by the bill of complaint herein.

8. The Territory of Kansas by its legislature, recognized and approved the said doctrine of appropriation, and in pursuance thereof in 1859 authorized the St. Charles Town Company to divert the waters of the South Platte river and Cherry creek, and the Mountain Company to divert the waters of the Platte river, and the El Paso Town Company to divert the waters of the tributaries of the Arkansas river heading at Pike's Peak; and in 1860 authorized the Capital Hydraulic Company to divert for irrigation purposes all the waters of the South Platte river and Cherry creek. And the State of Kansas, by its legislature, has also recognized, approved and adopted said doctrine; an act of said legislature enacted in 1868, authorizing corporations to construct canals diverting water for irrigation purposes; an act of the legislature enacted in 1886 providing that the running waters of the State might be appropriated for purposes of irrigation; an act of said legislature enacted in 1891, providing that in all that portion of the State west of the 99th meridian all natural waters, whether standing or running and whether surface or subterranean, should be devoted first, to purposes of irrigation in aid of agriculture, subject to ordinary domestic uses; and, second, to other industral purposes, and might be diverted from natural beds, basins or channels for such purposes and uses; and another act enacted in 1895 providing for the development of the land west of the 98th meridian by irrigation and regulating the distribution of water in the same manner as in Colorado. Said State by said several acts renouncing and surrendering all rights it may have had in said river or the lands adjacent thereto as riparian owner in con-

travention of the right to divert the waters thereof for irrigation in Kansas or Colorado.

And in reliance upon the approval and adoption of said doctrine of appropriation by said State of Kansas, about five hundred miles of large canals and ditches have been constructed in Kansas, west of the 97th meridian at a cost approximating two million dollars and thereby the waters of said Arkansas river have been appropriated and applied to about one hundred and fifty thousand acres of land in the valley of said river, in the State of Kansas.

9. By the act of Congress approved January 29th, 1861, admitting Kansas into the Union, it was specifically provided that the State should never interfere with the primary disposal of the soil within the same by the United States, or with any regulations Congress might find necessary for securing the title in said soil to *bona fide* purchasers thereof, and that all laws of the United States not locally inapplicable should have the same force and effect within said State as in other States of the Union.

10. Following the admission into the Union of the State of Kansas, said doctrine of appropriation was further recognized by Congress as the law applicable to the public lands and the natural streams thereof, including those in the State of Kansas by the following acts:

An act approved July 26, 1866, by which it was provided that whenever, by priority of possession, rights to the use of water for mining, manufacturing or other purposes, have accrued and are recognized according to local customs, laws and decisions, the owners and possessors shall be maintained and protected in their rights;

An act approved July 9, 1870, in which it was provided that all patents granted, or pre-emptions or homesteads allowed, should be subject to any vested and acquired water rights or rights to ditches and reservoirs used in connection with such water rights;

An act approved March 3, 1877, known as "the desert land act," which declared that all waters of all lakes, rivers and other sources of supply upon the public land should remain and be held free for the appropriation and use of the public for irrigation, mining and manufacturing purposes, and in and by which it was also provided that by the construction of canals and ditches and the application of said waters to the irrigation of the public lands, the title to said lands might thereby be obtained from the United States;

An act approved March 3, 1891, confirming the rights of way over the public lands in the arid region for canals and reservoirs for irrigation purposes;

An act approved August 18, 1894, providing for the conveyance to the several States in the arid region of such public lands as they might reclaim and irrigate;

An act approved June 17, 1902, authorizing and undertaking the construction of canals, ditches and reservoirs in the arid region, including therein the State of Colorado and the western portion of Kansas, whereby the waters of the public lands might be diverted

and used for irrigation purposes, and appropriating for that purpose the proceeds of all moneys received from the sale of public lands in the States of Colorado and Kansas.

Under and by virtue of said act approved March 3, 1877, which was made applicable to lands in Colorado by an act approved March 3, 1891, several thousand acres of land in the Arkansas valley in the State of Colorado, were reclaimed and irrigated, and the diversions of water for said purposes are in part the diversions complained of in the said bill of complaint.

11. Said doctrine was further recognized by Congress by the appropriation, on October 2nd, 1888, of $229,000 for the purpose of investigating the extent to which the arid region of the United States might be redeemed by irrigation and for the segregation of the irrigable lands in such arid region, and for the selection of sites for reservoirs and other hydraulic works necessary for the storage and utilization of water for irrigation and also by a further appropriation made on March 2nd, 1889, of $450,000 for the like purpose, all of which moneys were expended in investigating and selecting reservoir sites and in running contour lines for the purpose of aiding and assisting those desiring to appropriate the waters of the natural streams and using the same for irrigating purposes.

12. The provisions of the constitution of the State of Colorado set forth and complained of in the bill of complaint, were adopted in harmony with and in pursuance of the policy of the United States in respect to the diversion and use of water in the irrigation of land, and the same do not conflict with or contravene any act of Congress bearing upon said appropriation and use, but, on the contrary, are intended as a constitutional guaranty that the right to divert water for beneficial purposes as authorized and encouraged by the acts of Congress referred to shall never be denied, and said provisions were accepted and approved by the action of Congress in admitting Colorado into the Union, and the several acts of the legislature of Colorado, referred to in said bill of complaint, have been enacted for the purpose of protecting and regulating appropriations made in pursuance of the usages and customs prevailing in the arid region and the rights of appropriation as recognized and confirmed by the acts of Congress referred to.

13. All grants and patents of land in the valley of the Arkansas, in the State of Kansas, were made by the United States, subject to the doctrine of appropriation heretofore set forth, and were accepted by the several grantees thereof with the knowledge that in the sale and disposition of the arid lands of the United States along said Arkansas river west of the 97th meridian, it had been and would be necessary to divert and use the waters of said river in the improvement and cultivation thereof, and said grants and patents of lands in the State of Kansas were made subject to the right of all persons desiring the use of the same for agricultural purposes to appropriate the waters of the Arkansas river, either in Kansas or Colorado, to the full extent of said river, and all patents granted and all pre-

emptions and homesteads allowed of lands in the valley of the Arkansas in the State of Kansas subsequent to July 9th, 1870, including in particular the lands described in the bill of complaint situated in Ford county, conveyed to said State of Kansas by the United States on the 13th day of June, 1889, and the lands in Reno county described in said bill of complaint conveyed to the said State of Kansas at divers times subsequent to said 9th day of July, 1870, were, by the act of Congress of July 9th, 1870, made subject to all water rights in said river and rights of ditches and reservoirs in connection therewith acquired in accordance with the local customs, laws and decisions of Colorado.

III.

This defendant, for further answer to the bill of complaint, says:

1. Many of the appropriations of the waters of the Arkansas river, in the State of Colorado, complained of in said bill of complaint, were made prior to the creation of the Territory of Colorado, and while said Arkansas valley was a part of the territory of Kansas, and defendant is, therefore, unable to state the times at which said appropriations were made or the amount of water thus diverted from said river.

2. Following the creation of the Territory of Colorado and prior to the year 1865, sixty-eight ditches and canals were constructed, and 615 cubic feet of water per second of time were thereby diverted from said river and its tributaries, and have at all times since been used in the irrigation of land in said Arkansas valley. From and including the year 1865 to the year 1870, 127 additional ditches and canals were constructed, and 458 cubic feet of water per second of time were thereby diverted from said river, and at all times since have been continuously used in the irrigation of lands in said valley. From and including the year 1870 to the year 1880, 268 additional ditches and canals were constructed and 945 cubic feet of water per second of time thereby diverted, and at all times since used in the irrigation of land in said valley. From and including the year 1880 to the year 1890, 250 additional ditches and canals were constructed, and 3,859 cubic feet of water per second of time thereby diverted from said river, and at all times since continuously used when obtainable in the irrigation of land in said valley. All of said ditches and canals have been constructed by individuals and corporations, and the water, when obtainable, has been taken from said river and applied to the reclamation and irrigation of about five hundred thousand acres of land in said valley which, before said diversion and use, was arid and incapable of producing crops, all of said lands being in the watershed of and riparian to said river, and none of the waters of said river being diverted and carried to lands beyond the watershed of said river.

3. In the construction of said canals and ditches and the reservoirs connected therewith, many million dollars have been expended, and in the lands irrigated by means of said ditches and canals, and

in the improvements thereon and the machinery used in the cultivation thereof more than twenty-five million dollars have been invested. Numerous towns and villages have grown up in said valley in the State of Colorado, having an aggregate population of more than one hundred thousand, and houses, stores, churches, school houses, factories and public and private buildings for various purposes have been constructed for occupation and use, and actually used in connection with the continued settlement and cultivation of the lands in said valley by the use of the waters of said Arkansas river, the amount so invested aggregating many million dollars.

4. In 1879 and 1881 the legislature of Colorado enacted certain statutes providing for the adjudication of rights to water by appropriation for agricultural uses from the streams in said State, under and by virtue of which irrigation districts were created along the entire length of the Arkansas river in said State, and proceedings were thereupon had in each of said districts in which the owners of ditches and canals taking water from said Arkansas river and its tributaries were parties, and in which the amount of water to which each ditch or canal was entitled was ascertained and decreed. In said proceedings the owners of 713 ditches and canals were parties, and decrees were entered finding the various amounts of water that had been appropriated from said river and its tributaries, and applied to beneficial uses in the irrigation of said lands in said valley, and the dates of said appropriations. In said adjudications many thousand dollars were expended in costs, attorney fees and other necessary expenses in the belief that by said decrees the right of each appropriator, in the order of his appropriation, to the waters of said river had been established as a perpetual property right.

5. The State of Kansas and the inhabitants thereof, well knew that, commencing in said State at about the 97th meridian, and thence continuing westward to the Rocky mountains, the land was arid and incapable of being settled upon or cultivated, except by the diversion and use of the waters of the natural streams, and that diversions of the waters of the Arkansas river were being made at the times and in the amounts and for the purpose hereinbefore set forth, and that such diversions were made under a claim of right to the continued use of the waters of said river as against all owners of land in the valley of the Arkansas throughout its entire length, and that the settlement of said valley in the State of Colorado and the expenditure of the amounts hereinbefore stated, and the construction of canals, ditches and reservoirs, and in lands, buildings and improvements, and in houses, stores, factories, and public and private buildings, was made in reliance upon the right to divert the waters of said river and to continue such diversion in perpetuity.

6. Prior to the filing of the bill of complaint herein, neither the State of Kansas, nor the owners of lands in the Arkansas valley in said State, complained of said diversions, nor the right to make or continue the same, nor in any way or manner claimed or alleged any right upon the part of said State, or the owners of land in said

valley, to the flow of said river as it had been accustomed to flow prior to the making of said appropriations; but, on the contrary, the said State approved the diversion of water from said river and affirmed the right to make the same in the reclamation and irrigation of the lands along said river, by an act of the legislature of said State, enacted in 1886, authorizing and providing for the like diversion and use of the waters of said river in the State of Kansas, and by a further act, enacted in 1891, declaring that in that portion of the State of Kansas west of the 99th meridian all natural waters, whether running or standing, and whether surface or subterranean, should be devoted, first, to the purposes of irrigation in aid of agriculture; and, second, to other industrial purposes, and that said waters might be diverted from natural beds and channels for such purposes and use, and the owners of land in said valley in said State recognized and approved said appropriations, and the right to continue the same, by themselves constructing about five hundred miles of canals and ditches, and diverting the waters of said river for the irrigation of about one hundred and fifty thousand acres of land, and claimed the right so to do as against all owners of lands along the course of said river in Kansas or elsewhere.

7. The said State of Kansas and the owners of land in the valley of the Arkansas, in said State, have at all times acquiesced in the appropriation of the waters of the Arkansas river in the State of Colorado, and have waived, surrendered and relinquished any and all riparian rights now claimed by them, and by their delay in the filing of the complaint herein have caused the several appropriators of water from said river in Colorado to make the expenditures hereinbefore mentioned, and the people in said valley to settle upon, improve and cultivate the lands, and to build towns and cities, and for that purpose to expend the sums hereinbefore mentioned; and they are now estopped, by their conduct and delay, from asserting or maintaining any of the rights claimed in the said bill of complaint.

8. Upon information and belief, this defendant avers that the owners of land adjoining said Arkansas river in the State of Kansas west of the 98th meridian have refused to assert or maintain any right to the flow of said river as against the right to divert and apply same to agricultural and other beneficial uses in the States of Colorado and Kansas, and have refused to authorize or encourage this or any other proceeding by the State of Kansas based upon their alleged rights as riparian owners and designed to destroy or impair the right to use the waters of said river for irrigation and other beneficial purposes as now practiced in the State of Colorado and in the State of Kansas west of the 98th meridian.

9. This defendant, in making the allegations set forth in this further and separate answer, disclaims any right to represent or act for any other persons or corporations diverting water from the Arkansas river, but makes such allegations for the purpose of bringing to the knowledge of the court the fact that in ascertaining and adjudging the rights of the several persons and corporations diverting water in

Colorado, it will be necessary to make parties to this proceeding the owners of lands in Kansas in whose behalf, in part, it is claimed this proceeding was instituted.

IV.

This defendant, for further answer to the bill of complaint, says:

1. The Arkansas river leaves the foot hills of the Rocky mountains at an elevation of about six thousand feet above sea level, and thence flows eastward over an elevated plateau known as the "Great Plains" for several hundred miles, with a practically uniform descent to the east, passing into the State of Kansas at an elevation of 3,350 feet and into the Territory of Oklahoma at an elevation of 1,000 feet. Through Colorado and Kansas it has a broad, level bed of sand, seldom entirely covered with water, the ordinary flow running in thin sheets in tortuous and constantly changing channels in the river bed. From the mountains, for four hundred miles eastward, the watershed of said river is naturally barren, treeless and without any vegetation, except the short sparse grass common to the Great Plains. The annual precipitation of moisture is about fourteen inches, most of which falls in local and violent storms. In its uncultivated condition, the land rapidly sheds the rainfall, discharges it into the river and prevents the saturation of the soil and the formation of springs by which said river and the tributaries along its course might be fed. The tributary streams are usually dry, carrying and discharging water into the river only in case of storms. The sun is seldom obscured, and commencing near the State line between Colorado and Kansas, and continuing eastward for at least two hundred miles, the winds are dry and constant, in the summer season becoming so heated as to burn and destroy the vegetation and to absorb such water as may be in the bed of said river. The waters supplied to said river for about four hundred miles of its course after leaving the mountains are irregular in discharge and constantly varying in quantity, and are not sufficient to cause a steady and permanent flow during any season of the year. The main supply of the river is from the snows and storms in the mountains. As the snow melts only during warm days, this supply is also irregular and uncertain, and the volume of water in the river, therefore, changes daily and even hourly. Long before irrigation was practiced in Colorado, it was observed that as the waters from the mountains flowed eastward, the volume constantly diminished, and this diminution was the more marked as the river passed beyond the area of local storms caused by the mountains. During the summer season, except when flooded by violent showers, the river, at a distance of from two hundred to four hundred miles from the mountains, would show no surface water other than occasional pools in the sand, and none of the water coming into said river in Colorado would flow to or across the lands in the central or humid portion of Kansas. The ordinary flow of said river in Kansas has been still further diminished by the destruc-

tion of timber on the watershed of said river in the mountains and by the extension westward of the cultivated area of lands in Kansas and Colorado which arrests the flow of water during rains into said river and increases the absorbing power of said land, and by the sinking in western Kansas of upwards of one thousand wells contiguous to said river, and the pumping and use of the waters thus obtained upon the adjoining land.

2. All of the canals, ditches and reservoirs in Colorado complained of in said bill of complaint have their headgates within one hundred and fifty miles of the mountains, and the waters diverted into said canals and ditches are the waters, which, if not so diverted, would be lost by seepage and evaporation long before reaching the lands in Kansas claimed to be injured by such diversion.

3. The waters of the Arkansas river diverted in Colorado are those which fall within the watershed of said river in said State, and they are diverted and used only upon such lands within said watershed as need the same for domestic and irrigation purposes, and all the said lands upon which said waters are used are lands entitled to the same as the riparian lands of said river.

4. By the practice of irrigation in the valley of the Arkansas in Colorado, the flow of said river in the State of Kansas, outside the flood periods, is increased, instead of diminished. A great part of the land lying between the foothills of the mountains and the State line, and extending several miles back from the river on each side, which, in its natural condition is devoid of moisture, as alleged in the bill of complaint, becomes saturated, irrigation producing a condition the same as that produced by abundant rainfall. Water veins and channels are created in the land, springs break out and the water seeking a lower level, continually exudes into the nearest dry channels coursing the country, making them perennial streams discharging water into the river. The storm and flood waters of the river are stored in large quantities and during the irrigating season are added to the water diverted directly from the river and applied to the land, thus serving to convert the flood waters of the river into an additional source of supply for the river during its lowest natural stages. As the irrigated area has moved eastward, the return and seepage waters from the lands irrigated have materially increased the flow of the river and water now flows continuously in said river at many points where, at low stages of the river, it was not accustomed to flow prior to the development of irrigation systems in Colorado, and at many points water is flowing in said river in greater abundance than it was accustomed to flow prior to the introduction of irrigation.

V.

This defendant, for further answer to the bill of complaint, says:

1. That it is a corporation organized under the laws of the State of Colorado, on or about the 12th day of September, A. D. 1889, by Martin Graham, James Graham and Walter Meagher, citizens of the

State of Colorado, for the purpose of constructing and operating an irrigating ditch to convey water for domestic use and irrigation purposes, upon certain riparian lands owned by the said Martin Graham and James Graham and on certain riparian lands leased by said James Graham and Martin Graham, owned by the State of Colorado. Said lands are situated in the county of Prowers, and State of Colorado.

2. That this defendant constructed a certain irrigating ditch, commencing work thereon on the 2nd day of October, A. D. 1889, which was completed in the month of November, A. D. 1889, and is known as the "Graham ditch," at a cost of ten thousand ($10,000.00) dollars. Said ditch begins on the south bank of the Arkansas river in the southeast quarter of section 25 (25), township twenty-two (22), south of range forty-five (45), west of the sixth (6th) P. M., running thence in a southeasterly direction to a point near the northeast corner of the southeast quarter, of section thirty-two (32), township twenty-two (22), south of range forty-four (44), west of the sixth (6th) P. M., thence south to the south line of said township, thence east along said south township line to the southeast corner of said township, thence north about one hundred and fifty (150) rods along the east line of said township to the said Arkansas river; said irrigating ditch being about seven (7) miles in length and having a carrying capacity of sixty-one (61) cubic feet per second of time.

3. Said ditch was built to supply water for irrigation and domestic purposes to the following described lands, to wit:

Southwest quarter southwest quarter section twenty-seven (27), south half southwest quarter, section twenty-eight (28), south half section twenty-nine (29), southeast quarter and south half southwest quarter section thirty (30), north half of northwest quarter and north half northeast quarter section thirty-one (31), north half northwest quarter, north half northeast quarter and southeast quarter northeast quarter section thirty-two (32), all of section thirty-three (33), all of section thirty-four (34), all of section thirty-five (35) and south half section thirty-six (36), all in township twenty-two (22), south of range forty-four, west of the sixth (6th) P. M., comprising thirty-two hundred eighty (3280) acres of land. That water has been used for irrigation and domestic purposes on thirty-two hundred forty (3240) acres of said land since the year A. D. 1889, requiring the full carrying capacity of said ditch of sixty-one (61) cubic feet per second of time to supply the same. That under the provisions of the laws of the State of Colorado, on or about the 1st day of July, A. D. 1895, in the district court of the third judicial district of the State of Colorado, in a cause entitled: "In the matter of the adjudication of priorities to the use of water for irrigation and domestic purposes in water district No. 57 of the State of Colorado," a decree was rendered adjudicating to this defendant a priority to the use of water for irrigation and domestic purposes, of sixty-one (61) cubic feet of water per second of time of date prior to August 25th, A. D. 1891.

4. That prior to and since the year A. D. 1889 the said James

Graham by mesne conveyances acquired title in fee to two thousand six hundred and eighty (2,680) acres of the said described riparian lands, and all rights thereto appertaining, being all of said lands except the said south half southwest quarter and southwest quarter southeast quarter section twenty-nine (29), south half southwest quarter, west half southeast quarter and southeast quarter of southeast quarter section thirty (30), north half northwest quarter, north half northeast quarter, section thirty-one (31), north half northwest quarter and northwest quarter northeast quarter section thirty-two (32), all in township twenty-two (22), south of range forty-four (44) west of sixth (6th) P. M., comprising six hundred (600) acres. That the six hundred (600) acres are owned by the State of Colorado, but that the same were leased by the said James Graham from the State of Colorado and had been leased by him even since the construction of said ditch and for a long time prior thereto up to the time of his death hereinafter referred to.

That the said James Graham became and was the sole owner in fee simple and lessee of the State lands described herein, as aforesaid, and of the said "Graham ditch," and became the sole owner and was the sole owner of the capital stock of this defendant at the time of his death which occurred on or about the 26th day of March, A. D. 1899. That said riparian lands, and all rights thereto appertaining, the "Graham ditch" and capital stock of this defendant is now owned and said State lands are now leased by the estate of the said James Graham deceased, which is still unsettled and is being administered upon as provided by the laws of the State of Colorado.

5. That said lands are bottom lands adjacent to the bed of said Arkansas river, a small portion of them occupying a part of the bed of the river; that they are fertile and productive, valuable for farming purposes and well adapted to the growing of corn, wheat, alfalfa, rye, domestic and wild grasses, orchards, fruits, vegetables and all like crops grown and usually grown in this latitude of the United States and that several hundred acres of alfalfa are now growing upon said lands by reason of irrigation from the said "Graham ditch." That the two thousand six hundred and eighty (2,680) acres of land owned in fee by the estate of James Graham as aforesaid, reclaimed from its arid state by means of irrigation from the said Graham ditch, constructed and operated as aforesaid by this defendant, is reasonably worth the sum of forty ($40.00) dollars per acre, or the total sum of one hundred seven thousand two hundred ($107,200.00) dollars. That the improvements thereon are reasonably worth the sum of ten thousand ($10,000.00) dollars, making a total valuation of one hundred seventeen thousand two hundred ($117,200.00) dollars. That if this defendant is deprived of its right of priority to the use of water of sixty-one (61) cubic feet per second of the time adjudged to it, as aforesaid, that said lands will become unfit for cultivation and only valuable for grazing and will return to their former arid state, and that the estate of James Graham, deceased, owner of said lands and of the capital stock of this defend-

ant, and of the "Graham ditch" as aforesaid, will be damaged in the sum of at least one hundred thousand ($100,000.00) dollars.

By reason of the foregoing this defendant has a prior and superior right to sixty-one (61) cubic feet of water per second of time for irrigation and domestic purposes upon said described lands by reason of said appropriation and decree of said district court and that the rights of this defendant to said sixty-one (61) cubic feet of water are prior and superior to any rights or claim of plaintiff or those whom it claims to represent.

VI.

This defendant, for further answer to the bill of complaint, says:

1. That while defendant avers and alleges that it is entitled to a priority to the use of sixty-one (61) cubic feet of water per second of time by reason of appropriation and of the decree of the district court, as aforesaid, as against plaintiff and all others, as an additional and further defense it alleges that it is entitled and has the right to the use of said sixty-one (61) cubic feet of water per second of time as a prior riparian right as against plaintiff and those whom it represents, for the reason that the natural rainfall in the vicinity of said tract of land is slight and insufficient for the growing and maturing of crops, fruits and vegetables and that the value of the above described lands for farming purposes depend entirely upon their being irrigated. That said lands occupy a part of and are adjacent to the bed of the said Arkansas river and have a frontage upon the Arkansas river upon the south side of seven (7) miles, and are riparian lands. That it is absolutely necessary and said lands reasonably require the use of said sixty-one (61) cubic feet of water per second of time to properly irrigate them so that crops, fruits and vegetables can be raised thereon. That said sixty-one (61) cubic feet of water per second of time used upon said lands for irrigation and domestic purposes does not exhaust the entire flow of the stream of water in the Arkansas river, and what is not necessarily consumed for irrigation and domestic purposes upon said described lands is returned by defendant to the said Arkansas river before it leaves the lands owned by the estate of the said James Graham, deceased.

2. That neither plaintiff nor any of the owners of riparian lands within the State of Kansas upon the said Arkansas river ever made any protest or objection to this defendant's building and operating said irrigating ditch, or to its appropriating and using said sixty-one (61) cubic feet of water per second of time upon said described riparian lands for irrigation and domestic purposes, although plaintiff and said owners of riparian lands well knew that this defendant was expending large sums of money in building and operating said irrigating ditch, in reclaiming said described arid lands and was using said sixty-one (61) cubic feet of water for irrigation and domestic purposes as aforesaid. That by reason of said laches plaintiff and said owners of riparian lands are estopped from asserting any claim or right against this defendant's using said sixty-one (61) cubic

feet of water per second of time for irrigation and domestic purposes upon said described lands.

3. That this defendant's said described riparian lands are situated on the Arkansas river, higher up and above the lands owned by plaintiff and the other owners of riparian lands upon the Arkansas river in the State of Kansas, to which plaintiff refers in its bill of complaint.

By reason of the foregoing, this defendant has a prior and superior riparian right to the use of said sixty-one (61) cubic feet of water per second of time for irrigation and domestic purposes upon said described lands, prior and superior to any right or claim of plaintiff, or any other persons whatsoever.

Wherefore, this defendant now having fully answered all the allegations in the plaintiff's bill of complaint, or so much thereof as the defendant is advised should be answered, asks to be herein dismissed with costs and charges in this behalf sustained.

CHARLES C. GOODALE,
Solicitor for the Defendant, The Graham Ditch Company.

[Endorsed:] Supreme Court U. S., October term, 1903. Term No. 7, original. The State of Kansas, complainant, vs. The State of Colorado *et al.* Answer of the Graham Ditch Company to the amended bill of complaint. Filed Oct. 14, 1903.

And afterwards, to wit, on the 2d day of November, A. D. 1903, and appearance for certain defendants was filed in the words and figures following, viz:

Order for Appearance.

Supreme Court of the United States, October Term, 1901.

STATE OF KANSAS, Complainant, vs. STATE OF COLORADO, THE ROCKY FORD CANAL, Reservoir, Loan & Trust Co., The Catlin Consolidated Canal Co., The Oxford Farmers' Ditch Co., The Lake Canal Co., *et al.*	No. 7, Orig'l.

The clerk will enter my appearance as counsel for the Rocky Ford Canal, Reservoir, Land, Loan and Trust Co., The Catlin Consolidated Canal Co., The Oxford Farmers' Ditch Co. and The Lake Canal Company.

(Name.) FRED A. SABIN,
(P. O. Address.) La Junta, Colo.

☞NOTE.—Must be signed by a member of the bar of the Supreme Court United States. Individual and not firm names must be signed.

[Endorsed:] Supreme Court U. S., October term, 1903. Term No. 7, orig'l. Appearance for certain def'ts. Filed Nov. 2, 1903.

And afterwards, to wit, on the 2d day of November, A. D. 1903, the following orders appear of record, viz:

In the Supreme Court of the United States, October Term, 1903.

STATE OF KANSAS, Complainant,
vs.
STATE OF COLORADO ET AL. } No. 7, Original.

On motion of Mr. Platt Rogers, of counsel, leave is hereby granted to file the answer of the Arkansas Valley Sugar Beet and Irrigated Land Company to the amended bill of complaint herein.
November 2, 1903.

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL. } No. 7, Original.

On motion of Mr. A. B. Browne, in behalf of counsel, leave is hereby granted to file the answer of the Fort Lyon Canal Company to the amended bill of complaint herein.
November 2, 1903.

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL. } No. 7, Original.

On motion of Mr. Fred A. Sabin, of counsel, leave is hereby granted to file the answer of the Rocky Ford Canal Reservoir, Land, Loan & Trust Company, the Catlin Consolidated Canal Company, the Oxford Farmers' Ditch Company and the Laguna Canal Company to the amended bill of complaint herein.
November 2, 1903.

And on the same day, to wit, on the 2d day of November, A. D. 1903, answers were filed in the words and figures following, viz:

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant, vs. THE STATE OF COLORADO, THE ARKANSAS Valley Sugar Beet and Irrigated Land Company, *et al.*, Defendants.	Original Proceeding No. 7.

Separate Answer of The Arkansas Valley Sugar Beet and Irrigated Land Company, One of the Defendants, to the Amended Bill of Complaint of the State of Kansas.

Platt Rogers, John F. Shafroth, Frank E. Gregg, Thomas H. Devine, Henry A. Dubbs, solicitors of the Arkansas Valley Sugar Beet and Irrigated Land Company.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant, vs. THE STATE OF COLORADO, THE ARKANSAS Valley Sugar Beet and Irrigated Land Company, *et al.*, Defendants.	Original Proceeding No. 7, October Term, 1903.

Separate Answer of The Arkansas Valley Sugar Beet and Irrigated Land Company, One of the Defendants, to the Amended Bill of Complaint of The State of Kansas, Complainant.

I.

This defendant, now and at all times hereafter saving to itself all and all manner of benefit or advantage of exception or otherwise that can or may be had or taken to the many errors, uncertainties and imperfections in the said bill contained, for answer thereto, or to so much thereof as this defendant is advised it is material or necessary for it to make answer to, answering, saith:

1. This defendant admits that the rise, course, drainage area and general physical characteristics of the Arkansas river and of the valley thereof, except as hereinafter set forth, are as stated in said amended bill of complaint.

2. This defendant denies that the said Arkansas river, in fact, or within the laws or departmental rules and regulations of the United States, a navigable stream either within the State of Colorado or the State of Kansas.

3. This defendant denies that any diminution of the flow of said river from the State of Colorado into the State of Kansas is wholly or mainly attributable to the diversion of the waters of said river in the State of Colorado; and denies that the normal flow of said river

at the State line, in the absence of irrigation, for ten months, or for any considerable period during the year, is upward of two thousand cubic feet per second, or any amount in excess of five hundred cubic feet per second.

4. This defendant admits that the ordinary and usual rainfall in the valley of said river west of the 98th meridian is inadequate for the growing and maturing of cultivated crops; and alleges that in that portion of the State of Kansas, the inhabitants thereof have resorted to and are now practicing the method of appropriating the water from said river and using the same for the irrigation of lands that for more than forty years has been practiced in the State of Colorado.

5. This defendant denies that from time immemorial, or at all, the waters of said river have flowed through underlying sand and gravel extending in width under the entire valley of the Arkansas river or any material portion thereof; and denies that any part of the course and flow of said river is beneath the surface of the bottom lands of the valley, or that the course or flow thereof is of any greater width than the channel of said river between its banks, or that there is any underflow of water co-extensive with the valley of said river passing from the State of Colorado into the State of Kansas or in or through said State of Kansas; and this defendant denies that the alleged underground waters of said river furnish sufficient moisture to grow ordinary farming crops in the absence of rainfall, unless supplemented by water applied by a system of irrigation such as is in use in Colorado and in the western part of Kansas.

6. This defendant denies that the flow of the river or the underground waters to any appreciable extent tends to cool or moisten the surrounding atmosphere, promote the growth of vegetation, enhance the value of lands or conduce directly or materially to the public health or the habitability of the valley; and alleges that such results throughout the arid and semi-arid portions of Kansas can only be produced by the diversion of water from the river and the application of the same by a system of irrigation to the adjoining lands, and the cultivation thereof.

7. This defendant denies that the value of the lands in the valley of the Arkansas in said State of Kansas is in any degree dependent upon the natural and normal flow of water in said river; and denies that the acts alleged to have been done by this defendant are wrongful; and denies that by reason of said alleged wrongs, or otherwise, the value of lands in the valley of the Arkansas river in the State of Kansas has been diminished in any sum whatever, or that the revenue of the State of Kansas arising therefrom has been or will be in any wise injuriously affected.

8. This defendant admits the acquisition by the State of Kansas of the lands mentioned in said bill of complaint and the conveyance of certain portions thereof to the grantees mentioned therein; and alleges that all of said lands so acquired by said State of Kansas and held by its grantees, as well as all lands acquired by settlers by

homestead, pre-emption or purchase, were at all times, and now are, subject to the riparian rights of other proprietors of lands in the valley of the Arkansas higher up said stream and to the right of other proprietors of land in said valley to appropriate the waters of said river and use the same in the irrigation thereof both in Colorado and western Kansas.

9. This defendant denies that the Arkansas river is now, or at any time has been, a navigable river in the State of Kansas or treated as such, or that the title to the bed of said river in the State of Kansas ever passed to said State, or that said State now is or ever has been the owner thereof or entitled to the control thereof, or has ever attempted to control the same save and except as by an act of the legislature of the State of Kansas, passed in 1886, it declared that the right to the use of running water flowing in a river or stream of Kansas, for the purposes of irrigation, might be acquired by appropriation; and by a like act, passed in 1891, declared that in that portion of the State west of the 99th meridian, all natural waters, standing or running, should be devoted first to purposes of irrigation in aid of agriculture, subject to ordinary domestic uses; and secondly, to other industrial uses, and that the same might be diverted from the natural beds, basins or channels for such purposes and uses; and as, by a like act subsequently passed, it enlarged and extended the right to use the natural waters of said State for irrigation purposes eastward to the 98th meridian.

10. This defendant has no knowledge of the several conveyances or grants of land in the valley of said river in the State of Kansas heretofore made by the Government of the United States, except as hereinafter set forth, and avers that all of the conveyances or grants referred to in said bill of complaint, including in particular the lands alleged to be owned by said State of Kansas, were made subject to all rights to water from said river for irrigation purposes theretofore and thereafter to be acquired, and were taken with full knowledge on the part of said State of Kansas, and by each and every grantee of said lands, that the waters of said river had been, were being and would be appropriated in the State of Colorado for beneficial uses in the irrigation of land, and that the lands in said valley in the State of Kansas west of the 98th meridian and in the State of Colorado could only be made available for agricultural purposes by like appropriation and use, and that the Government of the United States, as the primary owner of said lands, had assumed that it held the same subject to the appropriation of the waters of said river for irrigation purposes, and that all patents of land granted after July 9th, 1870, should be subject to all vested and acquired water rights in or over said river.

11. This defendant denies that the lands alleged in said bill of complaint to belong to the State of Kansas and situated in the counties of Ford and Reno depend for their value for farming purposes upon the flow of water in the bed of said river or upon the underflow beneath said land, or that they are entitled to the full,

free and natural flow of said waters which would naturally flow in said river to or beneath said land; and denies that the rights of the State of Kansas as the owner thereof are prior or superior to the rights of this defendant or of the lands irrigated by its several ditches and canals as hereinafter more particularly set forth.

12. This defendant denies that the diversion of the waters of the Arkansas river by this defendant and the use thereof in the irrigation of the lands lying under its several ditches and canals in any degree whatever diminishes the ordinary and usual flow of water in said State of Kansas, and on the contrary alleges that as a result of irrigation in the valley of the Arkansas in the State of Colorado, the lands irrigated act as reservoirs for the storage of the ordinary and usual flow of said river and of the flood and storm waters thereof, returning the waters not used by plant life or lost by evaporation to the bed of the river by the natural and ordinary process common to lands having abundant rainfall, and the average flow of water into said State of Kansas, outside of flood and storm periods, is thereby increased instead of diminished.

13. This defendant denies that it is carrying any of the waters of said river through its ditches or canals to lands not riparian to said river in the sense given to the word "riparian" in the bill of complaint, and alleges that all the lands under its said ditches and canals are within the water shed of said river.

14. This defendant denies that when the Territory of Kansas was created or the State of Kansas admitted to the Union, the water of said Arkansas river was wholly unappropriated, or that the common law and the riparian rights claimed in said bill of complaint extended over said valley in the State of Kansas, or that the owners of lands along said river were entitled to the unimpeded flow of the water of said river; but on the contrary avers that numerous appropriations of said water had been made for irrigation purposes long prior to the creation of said Territory and many more were made prior to the conveyance by the Government of the United States of any of the lands lying along or adjacent to said river, and that the necessity and right to divert the water of said river for the reclamation of arid land had, long previous to the creation of said Territory, been asserted and exercised by persons in possession of said lands, and said necessity and right were thereafter recognized by the legislature of the Territory of Kansas, and all lands along said river acquired by the State of Kansas, or by individuals or corporations within the Territory or State of Kansas, were taken and held with full knowledge of the climatic conditions which made necessary the diversion of the waters of said river west of the 98th meridian, and that appropriations had been, were being and would be made west of the 98th meridian within the States of Kansas and Colorado, and that to the extent of said appropriations the flow of water of said river might, by the laws, usages and customs then prevailing, be lawfully impeded.

15. This defendant denies that by its taking of water from said

river in the State of Colorado through its canals and ditches, and the use thereof in the irrigation of lands lying thereunder, the State of Kansas, or any of its citizens, or the owners of land along said river in the State of Kansas, have been injured in any degree whatever, or that the fertility of the lands or the use thereof to the fullest extent to which the same are naturally capable of use, have been diminished or impaired, or that the crops, trees and vegetation growing along said river have perished or will perish, or that the wells have become or will become dry, or that the salubrity or healthfulness of said valley, or of the lands adjacent to said river, have been or will be impaired.

II.

This defendant, for further answer and defense to said amended bill of complaint, says:

1. In the year 1882, the Arkansas Valley Land and Cattle Company, a corporation, became the owner in fee simple of a tract of land containing about eleven thousand, four hundred and fifty-five acres, lying along and including the north bank of the Arkansas river and in part including the bed thereof, commencing at the line between the States of Colorado and Kansas and ending at Big Sandy Creek, a distance following said river of about twenty-six miles, and extending north from said river from one-half mile to three miles, said tract of land extending continuously through townships 41, 42, 43, 44 and 45 west of the sixth principal meridian.

2. Said tract of land, in its natural condition, was barren and unproductive, the ordinary rainfall being insufficient to make crops or to render the land available for agricultural purposes.

3. Between the 29th of September, 1884, and the 1st of May, 1885, said The Arkansas Valley Land and Cattle Company constructed a canal then called and ever since known as the Buffalo canal, of a carrying capacity of about 100 cubic feet of water per second, beginning at a point on the north bank of the Arkansas river in the northwest quarter of the northwest quarter (N. W. N. W.) of section thirty-one (31), township twenty-two (22), south range forty-three (43) west, and running thence east and south of east to the State line, a distance of about eighteen miles; said canal being so constructed as to cover the tract of land above described and to furnish water from the Arkansas river for use upon the same in the watering of cattle, the irrigation of the soil, the raising of crops and other domestic uses; and from the time of the construction of said canal until the bringing of this action the waters of said Arkansas river have been diverted through said canal and used upon said tract of land for the purposes above mentioned.

4. At the point of termination of said Buffalo canal near the State line, which is about one and one-half miles north of the north bank of the Arkansas river, certain citizens and residents of the State of Kansas, after the completion of said Buffalo canal, continued said canal into the State of Kansas a distance of six miles for the pur-

pose of conveying such portion of the waters carried in said canal as were not used in the State of Colorado to the following described riparian and nonriparian lands in the State of Kansas, to-wit: the south half of the south half of the north half (S. ½ S. ½ N. ½) and the north half of the south half (N. ½ S. ½) of section twenty-two (22), the north half of the south half (N. ½ S. ½) of section twenty-three (23), the south half (S. ½) of section twenty-four (24) and that part of the northeast quarter (N. E. ¼) of section twenty-five (25) lying north of the Arkansas river, all in township twentythree (23), south range forty-three (43) west; the south half of the north half (S. ½ N. ½) and the south half (S. ½) of section twenty (20), the southwest quarter (S. W. ¼) of section twenty-one (21), the north half (N. ½) and a portion of the southwest quarter (S. W. ¼) of section twenty-eight (28) lying north of said Arkansas river; all of section twenty-nine (29), the north half (N. ½) and the northeast quarter of the southeast quarter (N. E. ¼ S. E. ¼) of section thirty (30), all in township twenty-three (23), south range forty-two (42) west; and from thence at all times hitherto the waters of said canal have been used in the irrigation and cultivation of said lands, said ditch so constructed and used being called and known as the Frontier or Pioneer ditch; said lands so irrigated thereby being, at the time of this action and still, owned by Harry Crittenden, T. B. Martin, Frank Crittenden, William Snavely, John Tomilson, Charles Woolman, Fred Pomeroy, John Schranstrom, William Rich, David Hess and John Donahue, all citizens and residents of the State of Kansas and, as hereafter shown, necessary parties plaintiff in this proceeding.

6. The defendant further says that after the first settlements were made in eastern Kansas for farming purposes, it was a prevalent belief for many years that the area of rainfall sufficient for the cultivation of crops moved westward with the cultivation of the land, and about the year 1882 it was generally claimed that the area of rainfall sufficient for the growth of crops had moved so far westward as to cover western Kansas and to extend thirty or forty miles into the State of Colorado. Acting under this belief, the country on both sides of the Arkansas river in Kansas, extending far back on the "Great Plains" and also extending into Colorado as far as the present town of Lamar, was taken up by settlers, acquiring title either from the Government of the United States by homestead or preemption, or from the owners of the lands granted to the State of Kansas and by said State conveyed to the Atchison, Topeka & Santa Fe Railroad Company. Residences and farm buildings were erected, school districts were established and school houses built and a comparatively large population was established on the lands extending from the 100th to the 103rd meridian, and particularly in the neighborhood of the line between the States of Colorado and Kansas. Following the year 1882 and continuing for several years there was a constant failure of crops due to insufficient rainfall, and a large part of the population referred to gradually moved out of the country. The people of the State of Kansas about 1886, realized that the lands

so settled upon were so destitute of moisture and the rainfall was so slight as to render them incapable of being cultivated, and that only by the diversion and application of the waters of the Arkansas river could agriculture be pursued in western Kansas and eastern Colorado. Thereupon the legislature of the State of Kansas, for the purpose of allowing and authorizing the diversion and use of the waters of said river for the purpose of reclaiming said lands, so far as situated in said State of Kansas, at its session in 1886 passed an act concerning irrigation, in which it was declared that "the right to the use of running water flowing in a river or stream in this State, for the purposes of irrigation, may be acquired by appropriation."

7. In reliance upon said act of the legislature of the State of Kansas and upon the laws, customs and usages prevailing in the State of Colorado respecting the diversion and use of water for agricultural purposes, there was constructed a certain ditch or canal then called and since known as the Amity canal, commencing on the north bank of the Arkansas river in the northwest quarter of the southwest quarter (N. W. S. W.) of section thirty-six (36), near the line between the north half and the south half of said section in township twenty-two (22) south, range forty-eight (48) west, and thence continuing in a general easterly direction through townships forty-seven (47), forty-six (46), forty-five (45), forty-four (44), forty-three (43), forty-two (42), and forty-one (41) west, and ending, in the year 1895, at a point in the county of Hamilton in the State of Kansas about thirty miles east of the State line,—a total length of about one hundred and ten miles. Said canal was of a carrying capacity of 302.9 cubic feet per second of time and was constructed for the purpose of furnishing water for irrigation and domestic uses on the lands lying under said canal in the States of Colorado and Kansas. The owners of said canal acquired and owned in fee simple nearly all the land lying under said canal and capable of being irrigated therefrom, both in Colorado and Kansas.

8. About the time of the construction of said Amity canal in the year 1887, numerous other ditches or canals were constructed in the counties of Hamilton, Kearney, Finney, Gray, Ford, Edwards, Pawnee and Barton in the State of Kansas, for the diversion of the surface and underflow of waters of said Arkansas river and the application of said waters to riparian and non-riparian lands in the valley of the Arkansas in the irrigation and cultivation thereof, and in particular to lands contiguous to the towns of Syracuse, Garden City, Cimarron, Dodge City, Kinsley, Larned and Great Bend, owned by the persons, citizens and residents of Kansas whose alleged rights are claimed by the bill of complaint herein to have been impaired by the diversion of the waters of said river in Colorado by this defendant and others.

Among other canals so constructed was the canal known as the Dodge City canal, covering the land in the county of Ford alleged in the bill of complaint to have been conveyed in 1889 to the State of Kansas by the Government of the United States to be used as a

soldiers' home, said canal also covering land lying north of and abutting upon said river for a distance of about thirty miles. Said land of the State of Kansas in Ford county was also covered by another ditch or canal constructed by the Kansas Water Works and Irrigating Company, a corporation organized and existing under the laws of the State of Kansas then called and since known as the Eureka canal, commencing near the town of Ingalls in the southeast corner of township 25 south, range 29, and extending thence a distance of about ninety miles, covering all the riparian and a large part of the non-riparian lands along said river in township 26 south, and ranges 21, 22, 23, 24, 25, 26, 27 and 28 west, and township 27 south, ranges 21, 22, 23 and 24 west, said lands being owned by citizens and residents of Kansas whose names are to this defendant unknown.

There was also constructed by the South Dodge Canal Company, a corporation organized and existing under the laws of the State of Kansas, a certain other ditch or canal on the south side of said river known as and called the South Dodge canal, covering the riparian lands of said river opposite the lands belonging to said State of Kansas; said canal commencing at or near the center of township 26 south, range 26 west, and extending thence eastward about fifteen miles and covering riparian and non-riparian lands, in townships 26 and 27 south, ranges 24, 25 and 26 west, said lands being owned by citizens and residents of Kansas whose names are to this defendant unknown.

This defendant further says that following the construction of said Amity canal, the following ditches and canals were constructed diverting the surface or underflow waters of said river, in the State of Kansas, to wit:

In the County of Hamilton.

A certain canal known as the Alamo canal, commencing on the north bank of said river near the center of said county and thence continuing to the east line of said county; said canal covering the lands north of and abutting upon said river in township 24 south, ranges 39, 40 and 41 west, said canal now being owned by the Alamo Irrigating Canal Company, a corporation organized and existing under and by virtue of the laws of the State of Kansas, and said lands covered thereby being owned in part by John E. Frost, J. V. Pratt, W. F. Reed, James Gates, W. J. Martindale, D. A. Monroe, L. C. Price and others, all residents and citizens of Kansas, who have, as defendant is informed, at all times when water was obtainable through said canal, used the same in the irrigation of said lands.

Also a certain canal known as the Occidental canal, commencing on the north bank of said river 5½ miles west of the town of Syracuse and thence continuing for 3½ miles eastward and carrying water for irrigation to lands in sections 9, 10 and 11 in township 24 south, range 41 west, being the lands lying on the north bank of and abut-

ting on said river, said lands now being owned by B. J. Woodley, L. Inge and L. T. Worden, all citizens and residents of Kansas.

Also a certain canal known as the Alameda canal, commencing on the north bank of said river 3½ miles west of the town of Syracuse and thence continuing eastward a distance of 4½ miles and carrying water for the irrigation of lands in sections 16, 17 and 18 in township 24 south, range 40 west, and section 12, township 24 south, range 41 west, said lands now being owned by C. F. Roe, E. J. Barber, Ben A. Wood, M. J. Clark, A. L. Huffman, Henry Packer and W. J. Parnell, all citizens and residents of Kansas.

Also a certain ditch or canal known as the Ford ditch, commencing on the south side of said river about 3 miles east of Syracuse and covering riparian and non-riparian lands south of said river, the amount and ownership of which is to this defendant unknown.

Also a certain ditch known as the Prosperity ditch, beginning on the south side of said river 6 miles east of Syracuse and thence continuing eastward 3½ miles and covering riparian and non-riparian lands lying south of said river, the amount and ownership of which is to this defendant unknown.

In the County of Kearney.

A certain canal called and known as the Amazon canal, commencing on the north side of said river about five miles west of the town of Hartland and thence continuing in a northeasterly direction a distance of about 54 miles and carrying water for the irrigation of riparian and non-riparian land lying along and north of said Arkansas river in township 25 south, range 37 west, and township 24 south, range 36 west, and townships 23 and 24 south, range 35 west, and township 23 south, range 34 west, said lands belonging to citizens and residents of Kansas whose names are to this defendant unknown.

Also a certain ditch known as and called the Great Eastern ditch, commencing on the north side of said river about ½ mile west of the town of Hartland and continuing thence eastward a short distance and carrying water for the irrigation of riparian and non-riparian lands north of said river, the amount and ownership of which is to this defendant unknown.

Also a certain ditch belonging to one A. L. Derlinger, a citizen and resident of Kansas, commencing on the south side of said river about 5 miles west of Hartland and continuing thence about 4½ miles, covering the lands of said Derlinger on the south side of said river, the amount of said land being to this defendant unknown.

Also a certain ditch known as the Lakin or South Side ditch, beginning on the south side of said river 2 miles west of the town of Hartland and thence continuing a distance of 25 miles and carrying water for the irrigation of lands lying in township 25 south, ranges 35, 36 and 37 west, belonging to citizens and residents of Kansas whose names are to this defendant unknown.

In the County of Finney.

A certain ditch or canal known as the Kansas City or Farmers' ditch, owned by the Finney County Farmers' Irrigating Company, a corporation organized and existing under the laws of the State of Kansas, commencing on the north side of said river 10 miles east of the town of Lakin and thence continuing in a northeasterly direction for about thirty miles and carrying water to riparian and non-riparian lands in townships 23 and 24 south, ranges 32, 33 and 34 west, the amount and ownership of said land being to this defendant unknown.

Also a certain ditch or canal known as the Garden City ditch, commencing on the north side of said river 4 miles west of Garden City and thence continuing eastward and carrying water to lands lying in and about Garden City in township 24 south, ranges 31, 32 and 33 west, the amount and ownership of said land being to this defendant unknown.

In the County of Gray.

A certain ditch or canal known as the Soule ditch, beginning on the north side of said river 2 miles west of the town of Ingalls and thence continuing eastward about 20 miles and carrying water to riparian and non-riparian lands in township 27 south, ranges 27 and 28 west, the amount and ownership of said lands being to this defendant unknown.

Also a certain ditch known as the Ranger ditch, commencing on the south side of said river about 3 miles west of the town of Ingalls and thence continuing eastward and irrigating lands, the amount and ownership of which is to this defendant unknown.

Also a certain ditch or canal known as the Economy ditch, commencing on the south side of said river below the town of Ingalls and thence continuing eastwardly a distance of about 5¾ miles and carrying water to about 100 acres of riparian land, the ownership of which is to this defendant unknown.

This defendant further alleges that certain other ditches and canals were constructed in the counties of Edwards and Pawnee, diverting water for the irrigation of riparian and non-riparian land, the names of which and the lands irrigated thereby this defendant has been unable to ascertain.

9. All of the ditches and canals above mentioned, as this defendant is informed and believes, have diverted and carried water for the irrigation of the lands lying thereunder when obtainable, and the owners of said lands have used the waters so diverted in the irrigation and cultivation thereof, and have at all times disclaimed and renounced any and all rights they might have to the continuous flow of the surface or underflow waters of said Arkansas river in contraversion of the right to divert and apply the same to the irrigation of riparian and non-riparian lands in said valley, and the respective owners of said ditches and canals and of the riparian and non-

riparian lands thereunder are, as this defendant respectfully suggests, necessary parties to any determination of the right of this defendant to divert and use the waters of said river as it has been accustomed to do each and every year since and including the year 1887.

10. The construction of said Amity canal and of other canals in Colorado, and of the said canals in Kansas, and the reclamation and cultivation thereby of the arid and semi-arid lands of said States of Colorado and Kansas, were well known to the owners of riparian and non-riparian land throughout the entire valley of the Arkansas in Kansas; detailed accounts of the same were published in all the papers issued in the various towns in said valley, and from time to time excursions were taken by many of the people of said valley to inspect and report upon the irrigation systems in vogue in Colorado and in particular the ditches in and about Rocky Ford and the ditches now owned by this defendant, and the owners of non-irrigable lands in said valley were constantly moving to and settling upon lands under said canals and ditches in Colorado and Kansas.

Commencing about the year 1886 and continuing at intervals to and including the year 1903, conventions of the owners of riparian and non-riparian lands in said valley, and of the citizens thereof, have been called and held at Garden City and at other towns and cities in said valley, to consider and devise methods for extending the system of irrigation used by the Amity and other canals in Colorado, and said canals in Kansas, and at said conventions full and complete reports of the progress of irrigation in the valley of the Arkansas in Colorado have been made and the taking of the waters of said Arkansas river by said canals in the State of Colorado has at all times been acquiesced in, approved and the right to do so confirmed.

11. On February 14, 1889, the Senate of the United States adopted a resolution that a special committee of seven Senators be appointed by the President of the Senate, to be known as the "Special Committee on the Irrigation and Reclamation of Arid Lands," whose duty it should be to consider the subject of irrigation and the best mode of reclaiming the public lands of the United States. Said committee was duly appointed and thereafter, in the month of September, 1889, held sessions at various points in the valley of the Arkansas river in Kansas to receive the statements of the owners of land and the citizens in said valley concerning irrigation. At the several sessions of said committee, many of said owners of lands and citizens were in attendance and it was represented by them that the larger part of said valley was uninhabitable and incapable of being cultivated except by the irrigation thereof; that the people had settled upon the lands in said valley and had taken up the same and had acquired title of the Government of the United States during a cycle of sufficient rainfall and in the belief that in paying to the Government of the United States the price of said lands they had obtained lands susceptible of cultivation and the raising of crops; that it had been found that the rainfall was insufficient to

grow or mature crops; that many of those acquiring title from the Government had been compelled to leave the country, and that the remainder, while hopeful of being able to reclaim and cultivate a large portion of the riparian and non-riparian lands of said valley, were too poor to construct the necessary irrigation works. It was therefore urged that having received the price and value, of said lands as lands capable of cultivation and being made productive, the Government was in duty bound to assist in the exploration of the water supply of said valley and in the construction of works adapted to the irrigation of said lands. Constant reference was made to the ditches and canals that had been constructed in the State of Colorado and the diversion of the waters of the Arkansas thereby, and to the beneficial effect secured by the irrigation of lands in said State, but no objection or protest was made to such diversions of water, nor was any claim made that the water of said Arkansas river should continue to flow from the State of Colorado into the State of Kansas as it had formerly done, but on the contrary it was urged that the Government should build, or aid in building, reservoirs in the mountains in Colorado in which to impound and store the waters of said river that the same might thereafter be carried down said river for use in the irrigation of lands in Colorado and Kansas.

12. In September, 1891, a convention of irrigators and owners of lands in the arid and semi-arid regions west of the Missouri river was held at the city of Salt Lake in the then Territory of Utah, said convention being known as the "First irrigation congress." Delegates to said convention were sent by the governor of Kansas and most of the delegates from Kansas were from the Arkansas valley and were sent to and appeared in said convention as the special representatives of the owners of lands in said valley. Said delegates reported to the members of said convention the circumstances under which the lands in said valley had been taken up and the price paid therefor to the Government of the United States; that the Government had received for said lands an amount approximating six million dollars; that the land had been found to be unfit for cultivation or habitation without irrigation, and the convention was urged by them to demand of the Government of the United States that it should encourage, promote and assist in the construction of the necessary irrigation works whereby to obtain water for the irrigation of the lands in said valley, and the platform adopted at said irrigation congress, known as the "Salt Lake platform," was prepared at the instance and request of said delegation from Kansas, representing the views and wishes of all the owners of riparian and non-riparian lands in said valley of the Arkansas in Kansas, said platform being in part as follows:

"Whereas, large areas of arid lands and semi-arid lands situated upon the great plains in the Dakotas, Western Nebraska, Kansas and Oklahoma were settled upon in good faith by homeseekers, under the supposition that they were obtaining agricultural lands;

"And whereas, the settlers upon such lands have expended much time and labor upon the same and paid into the United States Treasury therefor many millions of dollars, only to discover that irrigation, to a greater or less extent, is necessary in making homes for themselves therein;

"Therefore, be it resolved, That the representatives of all the States and Territories directly concerned in irrigation, do hereby pledge their unwavering support to the just demands of such settlers that the General Government shall donate at least a portion of the funds received from the sale of such lands toward the procurement of the means necessary for their irrigation."

At said convention reference was made by said delegates from Kansas to the irrigation works constructed at Greeley, Rocky Ford and along the Arkansas river in Colorado, and the same was appealed to as a demonstration of what may be accomplished by irrigation, and it was urged that the like system should, by Government aid, be applied in the valley of the Arkansas in Kansas, and it was further urged that the Government should make an irrigation survey of the lands in Kansas to aid those desiring to construct ditches or canals and to furnish information to all persons wishing to know the lines which might be followed by canals and ditches in said valley.

At subsequent meetings of said irrigation congress, held at Los Angeles in 1893, and in Denver in 1894, delegates representing the owners of lands in and the citizens of said valley were present, urging the support of said convention in the application of the people of said valley to the Government for aid in the construction of irrigation works. In all of said conventions the demands of the delegates from the State of Kansas were acceded to and the Government of the United States was induced to and did make an irrigation or contour survey of the lands in the valley of the Arkansas for the purpose of aiding in the extension of the irrigable area thereof.

Said irrigation congress, at its session in Los Angeles elected Judge J. S. Emery, of the State of Kansas, its president, and immediately thereafter appointed him as lecturer on the subject of irrigation, and said Emery commencing immediately thereafter at various times addressed the citizens and owners of lands in said Arkansas valley in Kansas and made known to them in detail the results of irrigation as practiced in Colorado by the use of the waters of the Arkansas river.

13. On March 10, 1891, the legislature of the State of Kansas passed an act providing for and regulating the diversion, appropriation, storage and distribution of waters for industrial purposes within prescribed limits, and the construction, maintenance and operation of works therefor, and therein and thereby provided that:

"In all that portion of the State of Kansas situated west of the 99th meridian, all natural waters, whether standing or running, and whether surface or subterranean, shall be devoted first to purposes of irrigation in aid of agriculture, subject to ordinary domestic uses,

and secondly to other industrial purposes, and may be diverted from natural beds, basins or channels for such purposes and uses; provided that no such diversion shall interfere with, diminish or divest any prior vested right of appropriation for the same or a higher purpose than that for which such diversion is sought to be made, without a due legal condemnation of and compensation for the same."

In and by said act certain provisions were adopted concerning the use and sale of waters diverted substantially the same as those theretofore in force in the State of Colorado; and thereafter by an act passed by said legislature in 1895, said statute was made applicable to all that portion of Kansas west of the 98th meridian.

By another act passed by said legislature on March 5, 1895, a board of irrigation, survey and experiment was created, which was required to conduct experiments in irrigation in the State and appropriations in aid thereof were made by said legislature.

By a subsequent act passed by said legislature, a commissioner of forestry and irrigation was created and an appropriation made for the maintenance of an experimental station at which demonstrations should be made of the methods and value of irrigation.

The supreme court of said State of Kansas, in the case of Koen vs. Kline, decided on the 6th day of July, 1901, declared that the legislature of Kansas had by the acts above mentioned recognized the principle of irrigation in the State of Kansas and made the promotion of irrigation west of the 98th meridian a public use.

14. Acting in reliance upon the laws, customs and usages thus prevailing in the State of Kansas respecting the diversion and use of the waters of said State, and in the belief that it was the desire and policy of said State, and of the inhabitants and the owners of lands in the valley of the Arkansas in said State, that the lands in said valley should be reclaimed and made fruitful and productive by irrigation, and that all claim of riparian rights contrary to or in derogation of the right to divert the waters of the said Arkansas river for irrigation purposes had been surrendered and relinquished by said State and by the several owners of lands in said valley, the owners of said Amity canal, in the year 1895, acquired title to 121,522 acres of land lying north of and along said Arkansas river in the State of Kansas,—39,103 acres being situated in Hamilton county, 48,749 acres being situated in Kearney county, 1,857 acres being situated in Finney county and 11,812 acres being situated in Gray county; all of said lands being part of the lands alleged by the bill of complaint herein to have been granted to the State of Kansas to aid in the construction of certain railroads in said State, and thereafter conveyed to the Atchison, Topeka & Santa Fe railroad, and being the lands upon behalf of which and the owners thereof, relief is specifically sought by the bill of complaint herein. All of said lands were acquired for the purpose of irrigating the same by an extension of said Amity canal from its then terminus in the county of Hamilton across said counties of Hamilton, Kearney Finney and Gray.

15. By reason of the acquisition of said lands in the State of Kansas and of the insufficiency of the flow of water of said river during the latter part of the irrigating season, the owners of said Amity canal, and of the lands lying thereunder in the State of Colorado and of said lands in the State of Kansas acquired as aforesaid, undertook the construction of a system of reservoirs in townships 19 and 20 south, ranges 47 and 48 west, in the county of Kiowa in the State of Colorado, with the necessary supply and delivery canals, for the purpose of impounding in said reservoirs, when and as the same might be obtained, the waters of said Arkansas river, and thereafter carrying the same, through the delivery canals of said system, into said Amity canal, to be thence delivered and used in the irrigation of the lands lying thereunder in the States of Colorado and Kansas, and, by an extension of said canal, in the irrigation of the lands in said State of Kansas acquired as aforesaid.

In the construction of said reservoir system, a supply canal was built in the year 1897, commencing at a point on the north bank of the Arkansas river on the south line of section 29, township 23 south, range 55 west, extending thence in a northeasterly direction a distance of 80 miles, said canal being of an average width of 60 feet from its headgate for a distance of 40 miles, with a carrying capacity of about 2,000 cubic feet of water per second of time, and for the remaining 40 miles with an average width of 40 feet with a carrying capacity of 1,200 cubic feet per second. Said reservoirs were constructed in the year 1897 with a surface area of about 12,000 acres and with a shore line approximating 60 miles, the holding capacity of said reservoirs being about 250,000 acre feet.

There were also constructed certain delivery canals, aggregating 23 miles in length, with a carrying capacity of 600 cubic feet per second, through and by means of which the waters stored in said reservoirs were to be carried to and delivered into said Amity canal.

There was expended in constructing said reservoir system more than $500,000.

16. After the construction of said reservoir system and the use thereof in connection with said Amity canal, it was developed that the water obtainable by said system and by the direct diversion of the Amity canal from said Arkansas river during the irrigating season was not sufficient to irrigate all the lands in Colorado and Kansas intended to be irrigated thereby, and the irrigation of the lands in Kearney, Finney and Gray counties, and a portion of those in Hamilton county was, in the year 1901, abandoned for the time being, but said lands are now owned by persons originally concerned and interested in the said Amity canal and the construction of said reservoir system.

17. In February, 1901, this defendant became a body corporate under and by virtue of a compliance with the laws of the State of New Jersey and duly authorized to acquire and hold lands and water rights in Colorado and Kansas, and, relying upon the laws, customs, usages and policy of the State of Kansas respecting the

diversion and use of water in the reclamation and cultivation of arid lands, and of the waiver, surrender and relinquishments by said State of Kansas and the owners of lands in said Arkansas valley of all riparian rights in said river contrary to or in derogation of the right to divert the waters thereof for irrigation, as well as upon the acts of Congress respecting the diversion and use of the waters of the streams flowing on the public lands, and the surrender by the United States of all rights which might be claimed therein in derogation of the right to divert the same for irrigation, and as well upon the acts of the legislature of Colorado and the laws, customs and usages prevailing in said State in respect to irrigation, all of which this defendant avers was well known to the owners of riparian and non-riparian lands in said Arkansas valley in the State of Kansas, this defendant, on the first day of July, 1901, acquired title to said Buffalo and Amity canals and said Great Plains reservoir system, subject to the rights of all owners of lands diverting the waters of said river through said canals for the irrigation thereof and of about one hundred thousand acres of land in Colorado and Kansas lying under and irrigable from said canals and reservoirs, and invested in said properties about three million dollars.

18. About the year 1890, the colonization of the lands under said Amity and Buffalo canals was commenced and from time to time until the filing of the amended bill of complaint herein, tracts of land, varying from 5 to 160 acres, with the right to the carriage through said canals of the waters of said Arkansas river to be used in the irrigation thereof, had been sold, the aggregate thereof being more than 40,000 acres, and the purchasers thereof have entered upon and improved the lands so sold to them, erecting houses and barns, building fences, planting trees and orchards, growing grains, grasses and vegetables and conducting the usual farming operations. Several towns and villages have grown up under said canals, and buildings for churches, schools, stores, residences and other public and private purposes have been erected,—all of said reclamation, cultivation and improvement being made in reliance upon the continued use of the waters of said Arkansas river in the irrigation of said lands; the amount invested in said lands and the improvement thereof and in said towns and villages dependent thereon aggregating several million dollars. The deprivation of the use of the waters of said river in the irrigation of the lands lying under said Buffalo and Amity canals, as sought by the bill of complaint herein, would render all said improvements valueless, compel abandonment of said lands, depopulate said towns and villages and reduce all of the lands under said canals to their original desert and worthless condition.

Said lands were very largely settled upon and purchased by former citizens of Kansas, the valley of the Arkansas in both Colorado and Kansas being treated and considered by colonists and settlers as an entirety, its development having no reference to the State line.

In addition to the citizens of Kansas removing to and settling upon said lands, the following lands under the ditches, canals and

reservoir system of this defendant were, long prior to the filing of the bill of complaint herein, acquired in reliance upon the right to divert the waters of the Arkansas river and apply the same to the reclamation and irrigation thereof, by the following persons, who, at the time of the filing of the complaint herein, were and still are citizens and residents of Kansas:

The southwest quarter of section 18, township 23, range 41, by A. D. Jones.

Part of section 20, township 23, range 41, by W. J. House.

Northwest quarter of section 17, township 22, range 42, by P. M. Gillum.

Part of section 31, township 22, range 42, by W. R. Falkiner.

Part of section 31, township 22, range 42, by Thos. D. Alden.

Southeast quarter of southeast quarter of section 22, township 22, range 43, by B. F. Cochran.

Northwest quarter of southwest quarter of section 29, township 22, range 43, by S. F. Sales.

Northwest quarter of section 17, township 21, range 46, by Richard Turner.

West half of northeast quarter of section 34, township 21, range 46, by W. S. Metcalf.

Northwest quarter of section 10, township 22, range 47, by E. D. Kimball.

Northwest quarter of section 33, township 21, range 47, by John R. Mulvane.

Northeast quarter of northeast quarter of section 35, township 22, range 47, by W. B. Humphrey.

And this defendant submits that as the right of said citizens of Kansas and of all other persons owning lands under said canals and ditches to divert and use the waters of said river in the irrigation of their said lands is denied by the bill of complaint herein, they are necessary parties to a determination of the matters presented by said bill of complaint.

19. Several thousand acres of land under the Amity canal and the reservoir system of this defendant were, long prior to the filing of the bill of complaint herein, filed upon and the title thereto obtained from the Government of the United States by a compliance with an act of Congress approved March 3, 1877, known as the "desert land act," and the persons so acquiring title to the same are, by said act of Congress, entitled to continue to divert the waters of the Arkansas river and use the same in the cultivation of said lands.

20. This defendant respectfully submits that the State of Kansas is not as the owner, or the representative of the owners, of lands in said Arkansas valley in Kansas, entitled to the relief sought in said amended bill of complaint against this defendant, because, by the acts, doings and conduct of said State of Kansas and of the owners of lands in said valley as above set forth, and by the delay of said State in filing its said bill, and by the failure of the owners of lands

in said valley to assert the right claimed in their behalf by said State, this defendant and the owners of lands under said Amity and Buffalo canals and said Great Plains reservoir system have been induced to make large investments in reliance thereon, and said State of Kansas is in equity and good conscience estopped from now claiming any relief which would impair or destroy said investments, and this defendant therefore also submits that its rights in the premises cannot be ascertained or determined in this or any other proceeding without making the owners of land riparian to said Arkansas river in Kansas parties thereto.

21. This defendant further respectfully submits that aside from the laws, usages and customs concerning irrigation prevailing in the States of Colorado and Kansas, the said lands under said Buffalo canal and under said Amity canal were and are riparian to said river and entitled by the principles and doctrines of the common law claimed by the bill of complaint herein to be applicable in both Colorado and Kansas, to divert the waters of said Arkansas river and use the same in the irrigation thereof, and that the use of said water on said lands for all purposes necessary to making the same habitable and capable of sustaining human life, is a domestic use authorized and protected by the said principles and doctrines of the common law relied upon by the bill of complaint herein.

III.

This defendant, for further answer and defense to said amended bill of complaint, says:

1. On the 29th day of September, 1885, the predecessor in title of this defendant commenced the construction of a certain canal then called and since known as the Buffalo canal, commencing on the north bank of the Arkansas river in the northwest quarter of northwest quarter of section 31, township 22 south, range 43 west, and thence continuing to the line between the States of Colorado and Kansas, and thereby appropriated 100 cubic feet per second of the waters of said river and used the same in the irrigation of the lands situated under said canal, and at all times since the waters of said river, by virtue of said appropriation, have been diverted through said canal and used in the irrigation of said lands.

2. On the 21st day of February, 1887, the predecessor in title of this defendant commenced the construction of a certain canal then called and since known as the Amity canal, commencing on the north bank of the Arkansas river in the northwest quarter of southwest quarter of section 36, township 22 south, range 48 west, and thence continuing to a point in the county of Hamilton in the State of Kansas about thirty miles east of the State line, and thereby appropriated 284 cubic feet per second of the waters of said river and used the same in the irrigation of the lands situated under said canal, and at all times since the waters of said river by virtue of said appropriations have been diverted through said canal and used in the irrigation of said lands.

3. On the 10th of December, 1897, the predecessor in title of this defendant commenced the construction of a system of reservoirs situated in townships 19 and 20 south, ranges 47 and 48 west, in the county of Kiowa in said State of Colorado, with a holding capacity of about 250,000 acre feet and of an available capacity for the irrigation of lands of about 150,000 acre feet; and, for the purpose of impounding in said reservoirs the waters of said Arkansas river, commenced the construction of a feeder canal commencing on the north bank of the Arkansas river in section 29, township 23 south, range 55 west, and extending thence northeasterly a distance of 80 miles to said reservoir system; and, to carry the waters from said reservoir system into said Amity canal for the purpose of supplying the same to lands lying under said Amity canal, constructed delivery canals aggregating 25 miles in length and expended, in the construction of said work, the sum of five hundred thousand dollars and thereupon appropriated the waters of said river for storage and subsequent irrigation.

4. Said canals and said reservoir system were constructed and the diversion of the waters of said river made for the irrigation of lands lying under said canals and said reservoir system in accordance with and in reliance upon the doctrine respecting the appropriation of the waters of the natural streams for irrigation and other beneficial uses which, by usage and custom, prevailed in the arid region of the United States at the time of said appropriations and which, by the recognition and approval of the United States, has at all times been the law applicable to the public lands in said arid region.

5. Prior to the acquisition of private title to any of the lands acquired by the General Government from France, Mexico and Texas by purchase, cession and annexation, respectively, comprising all the lands now within the jurisdiction of the United States between the Mississippi river and the Pacific coast, said General Government caused said lands to be explored and reported upon for the purpose of ascertaining the natural resources and the physical and climatic characteristics of the various portions thereof, and by said explorations and information obtained from time to time, it became known to the United States and the inhabitants thereof that from about the 97th meridian to the coast range of the Pacific slope, the land was an arid waste without timber or useful vegetation, except in the mountains, and that although the soil was rich and fertile, and great deposits of gold, silver and other valuable minerals existed therein, the soil could not be made productive nor the minerals extracted, nor could the land be inhabited, except by the diversion of water from the natural streams and the application thereof to agricultural and mining uses, and that in that portion of said domain which lay south of the Arkansas river, and which had formerly been a part of Mexico, the laws, customs and usages there prevailing authorized and sanctioned the diversion and use of water for agricultural and other useful purposes in contravention of any right of the

riparian owner to have such water continually flow in its natural channel.

6. With the earliest settlement in said arid region for agricultural and mining purposes, which was long prior to the opening of said lands to pre-emption and purchase, by necessity, common consent and uniform practice, the doctrine obtained that the waters of all the natural streams flowing through said arid region were subject to diversion and use for agricultural purposes, and that the right to the water thus diverted could be obtained both as against the United States as the owner of the public lands and all grantees of the United States of lands lying along said streams, and that the right of the several appropriators from any given stream should be in the order of diversion and use, the first in time being first in right, and said doctrine has at all times been and now is the customary and statute law of said arid region in respect to the natural streams thereof.

With knowledge and in recognition of such right and custom of the inhabitants of such arid region to divert waters, and to apply the same to beneficial and necessary uses, the United States, in its treaty with Spain of February 22nd, 1819, and afterwards in its treaty of January 12th, 1828, with the United Mexican States, expressly stipulated and provided, that the use of the waters of the Arkansas river, and of certain other boundary streams, should be common to the respective inhabitants of both nations, parties to such treaties respectively.

7. Upon the creation and admission of the several Territories and States of said arid region, including Kansas, both as a Territory and State, they recognized, approved and confirmed, and from thence hitherto have enforced said doctrine, and rights to water diversion from the streams of said arid region have been maintained as against all claims of riparian rights in conflict therewith.

8. The Government of the United States, long prior to the sale by it of any of the public lands in the Arkansas valley, recognized and approved said doctrine, and applied the same to said public lands, and renounced and surrendered all riparian rights which it might have asserted in contravention of said doctrine, and from thence hitherto has held and disposed of said lands subject to and in accordance with said doctrine, and has at all times encouraged and promoted the diversion and use of the water of the streams in said arid region for agricultural and mining purposes, and by grants of public money has aided in the construction of canals, ditches and reservoirs and other appliances for the diversion, storage and use of water, in the reclamation and cultivation of the public lands.

9. By an act of Congress, approved September 4, 1841, and by subsequent acts relating thereto, the public lands, including the lands in said arid region were declared subject to pre-emption and homestead purchase, and all persons desiring to avail themselves of the provisions of said acts were required to make settlement upon the land in person and to inhabit and improve the same. It was then, and at all times since has been well known to the General

Government, and particularly to Congress and the executive departments having in charge the administration of said acts, that the provisions thereof in respect to settlement, inhabitancy and improvement could not be complied with in the pre-emption and purchase of arid lands, except by the diversion of the waters of the streams upon the public lands and the application thereof to domestic and irrigation purposes in reliance upon the continuance of the right so to do in accordance with said doctrine of appropriation.

10. By means of the diversion and use of the waters of said natural streams, many million acres of the public lands in said arid region have been settled upon, inhabited and improved and title thereto obtained from the General Government, in the belief that by its action and conduct in the disposition of its public lands, the United States had accepted and applied to said public lands the doctrine of appropriation as hereinbefore set forth; and there has been paid to said General Government, on account of said lands so improved by the diversion and use of water in accordance with said doctrine, upwards of twenty million dollars, and the greater part of the lands in the valley of the Arkansas in the State of Colorado, were settled upon and patents therefor obtained by proof of the diversion and use of the waters of said Arkansas river in the reclamation and improvement of said lands, said diversions so made being those complained of and sought to be enjoined in and by the bill of complaint herein.

11. The Territory of Kansas by its legislature, recognized and approved the said doctrine of appropriation, and in pursuance thereof in 1859 authorized the St. Charles Town Company to divert the waters of the South Platte river and Cherry creek, and the Mountain Company to divert the waters of the Platte river, and the El Paso Town Company to divert the waters of the tributaries of the Arkansas river heading at Pike's Peak; and in 1860 authorized The Capital Hydraulic Company to divert for irrigation purposes all the waters of the South Platte river and Cherry creek. And the State of Kansas, by its legislature, has also recognized, approved and adopted said doctrine; an act of said legislature enacted in 1868, authorizing corporations to construct canals diverting water for irrigation purposes; an act of the legislature enacted in 1886 providing that the running waters of the State might be appropriated for purposes of irrigation; an act of said legislature enacted in 1891, providing that in all that portion of the State west of the 99th meridian all natural waters, whether standing or running and whether surface or subterranean, should be devoted first, to purposes of irregation in aid of agriculture, subject to ordinary domestic uses; and, second, to other industrial purposes, and might be diverted from natural beds, basins or channels for such purposes and uses; and another act enacted in 1895 providing for the development of the land west of the 98th meridian by irrigation and regulating the distribution of water in the same manner as in Colorado. Said State by said several acts renouncing and surrendering all rights it may

have had in said river or the lands adjacent thereto as riparian owner in contravention of the right to divert the waters thereof for irrigation in Kansas or Colorado.

12. By the act of Congress approved January 29th, 1861, admitting Kansas into the Union, it was specifically provided that the State should never interfere with the primary disposal of the soil within the same by the United States, or with any regulations Congress might find necessary for securing the title in said soil to *bona fide* purchasers thereof, and that all laws of the United States not locally inapplicable should have the same force and effect within said State as in other States of the Union.

13. Following the admission into the Union of the State of Kansas said doctrine of appropriation was further recognized by Congress as the law applicable to the public lands and the natural streams thereof, including those in the State of Kansas, by the following acts:

An act approved July 26, 1866, by which it was provided that whenever, by priority of possession, rights to the use of water for mining, manufacturing or other purposes, have accrued and are recognized according to local customs, laws and decisions, the owners and possessors shall be maintained and protected in their rights;

An act approved July 9, 1870, in which it was provided that all patents granted, or pre-emptions or homesteads allowed, should be subject to any vested and acquired water rights or rights to ditches and reservoirs used in connection with such water rights;

An act approved March 3, 1877, known as "The Desert Land Act," which declared that all waters of all lakes, rivers and other sources of supply upon the public land should remain and be held free for the appropriation and use of the public for irrigation, mining and manufacturing purposes, and in and by which it was also provided that by the construction of canals and ditches and the application of said waters to the irrigation of the public lands, title to said lands might thereby be obtained from the United States;

An act approved March 3, 1891, confirming the rights of way over the public lands in the arid region for canals and reservoirs for irrigation purposes;

An act approved August 18, 1894, providing for the conveyance to the several States in the arid region of such public lands as they might reclaim and irrigate;

An act approved June 17, 1902, authorizing and undertaking the construction of canals, ditches and reservoirs in the arid region, including therein the State of Colorado and the western portion of Kansas, whereby the waters of the public lands might be diverted and used for irrigation purposes, and appropriating for that purpose the proceeds of all moneys received from the sale of public lands in the States of Colorado and Kansas.

Under and by virtue of said act approved March 3, 1877, which was made applicable to lands in Colorado by an act approved March 3, 1891, several thousand acres of land in the Arkansas valley in

the State of Colorado, were reclaimed and irrigated, and the diversions of water for said purposes are in part the diversions complained of in the said bill of complaint.

14. Said doctrine was further recognized by Congress by the appropriation, on October 2nd, 1888, of $229,000 for the purpose of investigating the extent to which the arid region of the United States might be redeemed by irrigation and for the segregation of the irrigable lands in such arid region, and for the selection of sites for reservoirs and other hydraulic works necessary for the storage and utilization of water for irrigation and also by a further appropriation made on March 2nd, 1889, of $450,000 for the like purpose, all of which moneys were expended in investigating and selecting reservoir sites and in running contour lines for the purpose of aiding and assisting those desiring to appropriate the waters of the natural streams and using the same for irrigating purposes.

15. The provisions of the constitution of the State of Colorado set forth and complained of in the bill of complaint, were adopted in harmony with and in pursuance of the policy of the United States in respect to the diversion and use of water in the irrigation of land, and the same do not conflict with or contravene any act of Congress bearing upon said appropriation and use, but, on the contrary, are intended as a constitutional guaranty that the right to divert water for beneficial purposes as authorized and encouraged by the acts of Congress referred to shall never be denied, and said provisions were accepted and approved by the action of Congress in admitting Colorado into the Union, and the several acts of the legislature of Colorado, referred to in said bill of complaint, have been enacted for the purpose of protecting and regulating appropriations made in pursuance of the usages and customs prevailing in the arid region and the rights of appropriation as recognized and confirmed by the acts of Congress referred to.

16. All grants and patents of land in the valley of the Arkansas, in the State of Kansas, were made by the United States, subject to the doctrine of appropriation heretofore set forth, and were accepted by the several grantees thereof with the knowledge that in the sale and disposition of the arid lands of the United States along said Arkansas river west of the 97th meridian, it had been and would be necessary to divert and use the waters of said river in the improvement and cultivation thereof, and said grants and patents of lands in the State of Kansas were made subject to the right of all persons desiring the use of the same for agricultural purposes to appropriate the waters of the Arkansas river, either in Kansas or Colorado, to the full extent of said river, and all patents granted and all preemptions and homesteads allowed of lands in the valley of the Arkansas in the State of Kansas subsequent to July 9th, 1870, including in particular the lands described in the bill of complaint situated in Ford county, conveyed to said State of Kansas by the United States on the 13th day of June, 1889, and the lands in Reno county described in said bill of complaint conveyed to the said State

of Kansas at divers times subsequent to said 9th day of July, 1870, were, by the act of Congress of July 9th, 1870, made subject to all water rights in said river and rights of ditches and reservoirs in connection therewith acquired in accordance with the local customs, laws and decisions of Colorado.

IV.

This defendant, for further answer and defense to said amended bill of complaint, says:

1. On the 29th day of September, 1885, the predecessor in title of this defendant commenced the construction of a certain canal then called and since known as the Buffalo canal, commencing on the north bank of the Arkansas river in the northwest quarter of northwest quarter of section 31, township 22 south, range 43 west, and thence continuing to the line between the States of Colorado and Kansas, and thereby appropriated 100 cubic feet per second of the waters of said river and used the same in the irrigation of the lands situated under said canal, and at all times since, the waters of said river by virtue of said appropriation have been diverted through said canal and used in the irrigation of said lands.

2. On the 21st day of February, 1887, the predecessor in title of this defendant commenced the construction of a certain canal then called and since known as the Amity canal, commencing on the north bank of the Arkansas river in the northwest quarter of southwest quarter of section 36, township 22 south, range 48 west, and thence continuing to a point in the county of Hamilton in the State of Kansas about thirty miles east of the State line, and thereby appropriated 284 cubic feet per second of the waters of said river and used the same in the irrigation of the lands situated under said canal, and at all times since the waters of said river by virtue of said appropriation have been diverted through said canal and used in the irrigation of said lands.

3. Said Buffalo and Amity canals were constructed and said waters were diverted and used in the irrigation of the lands situated under said canals in accordance with the local customs, laws and the decisions of the courts of the State of Colorado respecting rights to the use of water for mining, agricultural, manufacturing and other purposes then in force, enacted and made.

4. The right to appropriate the waters of said river through and by means of said canals for the purpose of irrigation to the extent above set forth was, in the year 1895, in certain proceedings then pending in the district court of the county of Bent in said State of Colorado, brought and conducted in accordance with the acts of the General Assembly of the State of Colorado enacted in 1879 and 1881, concerning the adjudication of rights to water for irrigation purposes, recognized and acknowledged and said right adjudged to be vested and accrued as of the date of the respective appropriations made by the construction of said canals.

5. The lands in Ford county alleged by the bill of complaint to

have been obtained by said State of Kansas by purchase from the Government of the United States in the year 1889 and used as a soldiers' home, as well as all other lands in the valley of the Arkansas in the State of Kansas acquired from the Government of the United States since the 21st day of February, 1887, were conveyed and taken subject to the appropriation and use of the waters of said Arkansas river through and by means of said Amity canal as above set forth.

6. The lands in said Arkansas valley in Kansas acquired from the Government of the United States since the 29th day of September, 1885, were conveyed to and taken by the several grantees thereof subject to the appropriation and use of the waters of said river through and by means of said Buffalo canal as above set forth.

7. This defendant respectfully submits that as to all lands in the valley of the Arkansas in Kansas acquired subsequent to the appropriation of the Amity canal as above set forth, the State of Kansas is not entitled, as against said canal, to the relief demanded in the bill of complaint herein; and that as to all the lands in said valley acquired subsequent to the appropriation of said Buffalo canal, as above set forth, the said State of Kansas is not entitled, as against said canal, to the relief demanded in said bill of complaint; and this defendant respectfully submits that the owners of lands in said valley are necessary parties to a determination of the rights claimed by the bill of complaint herein, and that they should be made parties plaintiff hereto and compelled to set forth the dates of the several conveyances to them by the Government of the United States of the lands now owned by them in said valley.

V.

This defendant, for further answer and defense to said amended bill of complaint, says:

1. On the 29th day of September, 1885, the predecessor in title of this defendant commenced the construction of a certain canal then called and since known as the Buffalo canal, commencing on the north bank of the Arkansas river in the northwest quarter of northwest quarter of section 31, township 22 south, range 43 west, and thence continuing to the line between the States of Colorado and Kansas, and thereby appropriated 100 cubic feet per second of the waters of said river and used the same in the irrigation of the lands situated under said canal, and at all times since, the waters of said river by virtue of said appropriation have been diverted through said canal and used in the irrigation of said lands.

2. On the 21st day of February, 1887, the predecessor in title of this defendant commenced the construction of a certain canal then called and since known as the Amity canal, commencing on the north bank of the Arkansas river in the northwest quarter of southwest quarter of section 36, township 22 south, range 48 west, and thence continuing to a point in the county of Hamilton in the State

of Kansas about thirty miles east of the State line, and thereby appropriated 284 cubic feet per second of the waters of said river and used the same in the irrigation of the lands situated under said canal and at all times since the waters of said river by virtue of said appropriation have been diverted through said canal and used in the irrigation of said lands.

3. The diversion and use of the waters of said river were made at the time of the construction of said canals and have been continued each and every year since, and until the filing of the amended bill of complaint herein, adversely to and in denial of the right of each and every riparian owner along said river in Kansas, as well as each and every owner of land in said Arkansas valley in Kansas, to the usual and ordinary flow of said river in Kansas over or along any of said lands as it had been accustomed to flow prior to the diversion of said waters by this defendant or by other appropriators in Colorado, and in denial of any right of the riparian owners along said stream or of lands in the vicinity thereof to the flow of the water of said stream, except as the same might continue after the diversion through and by means of said Amity and Buffalo canals of the waters of said river necessary to the irrigation of the lands lying thereunder.

4. The diversion of the waters of the Arkansas river in Colorado for irrigation purposes commenced more than 25 years prior to the construction of said Amity and Buffalo canals, and the flow of water in said river has been diminished by said appropriations and each and every owner of land along said river in Kansas and in the neighborhood thereof well knew, at the time said Amity and Buffalo canals were constructed and the diversion of water made thereby, that said canals, as well as all other canals along said river in the State of Colorado, were diverting and using said waters adversely to and in derogation of any and all rights which they might claim or possess as riparian owners with respect to the waters of said Arkansas river.

5. This defendant respectfully submits that by the statutes of the State of Kansas concerning the limitation of actions, the right of each and every owner of land along said Arkansas river in Kansas to the usual and ordinary flow of said river as the same existed prior to the appropriation of said waters in the State of Colorado, and in particular prior to the appropriation and diversion through and by means of said Amity and Buffalo canals, became lost by fifteen years' adverse use thereof and all right of action concerning said waters barred after the expiration of fifteen years from the commencement of the assertion and exercise of said adverse right.

VI.

This defendant, for further answer and defense to the said amended bill of complaint, says:

1. The Arkansas river leaves the foot hills of the Rocky mountains at an elevation of about six thousand feet above sea level, and thence flows eastward over an elevated plateau known as the "Great Plains" for several hundred miles, with a practically uniform descent to the east, passing into the State of Kansas at an elevation

of 3,350 feet and into the Territory of Oklahoma at an elevation of 1,000 feet. Through Colorado and Kansas it has a broad, level bed of sand, seldom entirely covered with water, the ordinary flow running in thin sheets in tortuous and constantly changing channels in the river bed. From the mountains, for four hundred miles eastward, the watershed of said river is naturally barren, treeless and without any vegetation, except the short sparse grass common to the Great Plains. The annual precipitation of moisture is about fourteen inches, most of which falls in local and violent storms. In its uncultivated condition, the land rapidly sheds the rainfall, discharges it into the river and prevents the saturation of the soil and the formation of springs by which said river and the tributaries along its course might be fed. The tributary streams are usually dry, carrying and discharging water into the river only in case of storms. The sun is seldom obscured, and commencing near the State line between Colorado and Kansas, and continuing eastward for at least two hundred miles, the winds are dry and constant, in the summer season becoming so heated as to burn and destroy the vegetation and to absorb such water as may be in the bed of said river. The waters supplied to said river for about four hundred miles of its course after leaving the mountains are irregular in discharge and constantly varying in quantity, and are not sufficient to cause a steady and permanent flow during any season of the year. The main supply of the river is from the snows and storms in the mountains. As the snow melts only during warm days, this supply is also irregular and uncertain, and the volume of water in the river, therefore, changes daily and even hourly. Long before irrigation was practiced in Colorado, it was observed that as the waters from the mountains flowed eastward, the volume constantly dimished, and this diminution was the more marked as the river passed beyond the area of local storms caused by the mountains. During the summer season, except when flooded by violent showers, the river, at a distance of from two hundred to four hundred miles from the mountains, would show no surface water other than occasional pools in the sand, and none of the water coming into said river in Colorado would flow to or across the lands in the central or humid portion of Kansas.

The usual and ordinary flow of said river into the State of Kansas, as it is claimed to have been prior to the diversion of water in Colorado by this defendant and others, has been materially diminished by the destruction of timber in the water shed of said river in the mountains, the removal of the protection which said timber afforded causing the snow to melt much earlier in the summer season than heretofore and to come down in floods, instead of a long sustained flow. The breaking up and tilling of the land lying on both sides of said river, which, in its natural condition, was hard and rapidly drained the water falling thereon, and the raising of crops on said land, both in Colorado and western Kansas, for a distance of about two hundred miles, has caused the rainfall on said lands to sink into the earth, instead of passing rapidly to the river, and as said lands so broken and tilled lie along the course of the

river, they have also intercepted the surface run-off from the drainage area back of and above said lands.

By the breaking and cultivation of said lands and the application of water thereto and the absorption by said lands of the rainfall which formerly flowed directly into the river, the physical characteristics of said river in respect to the flow of water therein has been materially changed. The lands so broken and cultivated were, in their natural condition, barren and devoid of moisture, except at extreme depths, and the gulches and water ways leading through them to the river were, at all seasons of the year, except in time of rain, entirely dry. By said artificial application of water and by the interception of the rain falling and draining upon said lands, the same condition has been and is being produced that obtains where rainfall is abundant. The lands have become saturated, veins and channels of water are thereby created and as the water seeks a lower level, it exudes by springs or swampy lands into the gulches and water ways, making them perennial streams discharging a uniform flow of water into the river.

Although the defendant is diverting water from said Arkansas river through the Amity and Buffalo canals, said diversion does not result in any injury to the State of Kansas or to the owners of lands in the valley of the Arkansas in said State, nor does the same, to any substantial degree, diminish the usual and ordinary flow of water in said river in western Kansas. Said canals are taken out in the eastern part of the State of Colorado and the waters diverted are largely those returned to said river by the lands cultivated and irrigated along the course of said river above the intake of said canals. The waters so diverted, together with the large bodies of flood and storm waters diverted and stored by this defendant in its reservoirs, permit the reclamation and irrigation of many thousand acres of land under said canals, much in excess of the number that might be irrigated by the direct diversion of water during the irrigating season, and all these lands thus become saturated, and year by year, as the area is extended, and as the water in course of time finds its way back to the river, the permanent and valuable flow of said river in western Kansas is conserved and increased, rather than diminished.

This defendant, now having fully answered all the allegations in the plaintiff's amended bill of complaint, or so much thereof as the defendant is advised should be answered, asks to be hence dismissed with cost and charges in this behalf sustained.

THE ARKANSAS VALLEY SUGAR BEET AND
IRRIGATED LAND COMPANY,
By WILLIAM M. WILEY, Manager.

PLATT ROGERS,
JOHN F. SHAFROTH,
FRANK E. GREGG,
THOMAS H. DEVINE,
HENRY H. DUBBS,
Solicitors of the Arkansas Valley Sugar
Beet and Irrigated Land Company.

UNITED STATES OF AMERICA, District of Colorado, } ss:

On this — day of October, A. D. 1903, before me personally appeared William M. Wiley, manager of the Arkansas Valley Sugar Beet and Irrigated Land Company, in the State of Colorado, and in accordance with the laws of said State designated as the agent of said company in said State upon whom process should be served, who made solemn oath that he had read the foregoing answer subscribed by him and knows the contents thereof, and that the same is true of his own knowledge, except as to the matters therein stated on information and belief and as to those matters he believes it to be true.

——— ———.

Subscribed and sworn to before me this — day of October, A. D. 1903.

——— ———.

[Endorsed:] Supreme Court U. S. October Term, 1903. Term No. 7, Original. The State of Kansas, complainant, vs. The State of Colorado *et al.* Answer of the Arkansas Valley Sugar Beet and Irrigated Land Company to amended bill. Filed Nov. 2, 1903.

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant, vs. THE STATE OF COLORADO ET ALS., Defendants. } Original Proceeding No. 7.

The Separate Answer of the Defendant, The Fort Lyon Canal Company, to the Amended Bill of Complaint of The State of Kansas, Complainant.

Chas. E. Gast, H. L. Lubers, solicitors for The Fort Lyon Canal Company, defendant.

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant, vs. THE STATE OF COLORADO ET ALS., Defendants. } Original Proceeding No. 7.

The Separate Answer of the Defendant, The Fort Lyon Canal Company, to the Amended Bill of Complaint of The State of Kansas, Complainant.

This defendant, now and at all times hereafter saving to itself all and all manner of benefit or advantage of exception or otherwise

that can or may be had or taken to the many errors, uncertainties and imperfections in the said amended bill of complaint contained, for answer thereto, or to so much thereof as this defendant is advised it is material for it to make answer to, severally answering, saith:

I.

That it is a corporation created, organized and existing under the laws of the State of Colorado; and, as such, it owns and operates what is known as the Fort Lyon canal, a canal used for the carriage and distribution of water for the irrigation of lands lying thereunder, and for supplying water to the owners of water rights in the said canal, for irrigation and other beneficial uses. The headgate of said canal is located at a point on the north bank of the Arkansas river in Otero county, Colorado; and the line thereof extends thence in an easterly direction through the counties of Otero, Bent and Prowers in the said State of Colorado, to what is known as Big Sandy creek, in Prowers county aforesaid, a distance and length of about one hundred and thirteen (113) miles.

The origin of the said canal was a certain canal constructed by the United States of America about the year 1860, for the purpose of irrigating certain lands then in occupation by the Cheyenne Indians, the headgate of which was located substantially at the same point where the present headgate of the Fort Lyon canal is situate. The original canal as constructed by the United States of America had a capacity of about fifty-two (52) cubic feet of water per second of time, and it extended from the headgate easterly for a distance of about three miles. Upon the removal of the said Cheyenne Indians to the Indian Territory, the original canal so constructed by the United States Government was abandoned; and in the year 1868 one George T. Reynolds appropriated the same to his own use, and ever since then it has been continuously used for the irrigation of lands lying thereunder. On or about the first day of February, 1884, the Arkansas River, Land, Town and Canal Company, a corporation organized under the laws of the State of Colorado, became the owner of the same, and at once began the enlarging and extension of the same, with the then intention of building a canal of substantially the same size and over substantially the same line as it is now completed, ending at Big Sandy creek. And thereafter the work of construction was carried on until the same was completed to a carrying capacity of 838.8 cubic feet of water per second of time, on or about the first day of April, 1889,—the said work being prosecuted continuously, with diligence, and as rapidly as the means of said company and its successors in interest would permit, and as rapidly as required to keep pace with the settlement and development of lands lying under said ditch. That from the year 1884 onward the acreage put under cultivation under the line of the said canal was being constantly increased from year to year up to the year 1890, when the whole capacity of the canal was exhausted by physical distribution to the lands lying under the said canal; that the

water appropriated by means thereof has been at all times diligently applied to the lands, for the raising of crops thereon; and that at all times the water obtainable from the said river by means of the said canal, and under and by virtue of said appropriation, has been necessary to the said beneficial use.

The defendant The Fort Lyon Canal Company, by various foreclosures and mesne conveyances, has succeeded to the title of the said canal, and the same is operated by it, not for profit, but to satisfy the water rights, privileges, appropriations and easements therein belonging to the consumers of water therefrom, and requiring for the carriage and delivery of the same the full capacity of the said canal,—each of the said consumers of water being a stockholder in the said company to the extent of the several right and appropriation made by him of such water.

The said defendant further alleges that there are one hundred thousand acres of land lying under the said canal occupied and in use, of which some sixty thousand acres have been reclaimed from an arid state and are now cultivated and farmed, and about forty thousand acres are at present used for grazing and pasturage; and that the present value of the lands lying under the said canal and irrigated therefrom, together with the water rights incident and appurtenant thereto, exceeds three million five hundred thousand dollars ($3,500,000); that valuable improvements, such as houses, barns, fences, and lateral ditches, have been built thereon. A prosperous community has established itself under the said canal, and various towns, such as La Junta, Las Animas and Lamar, having an aggregate population of about seven thousand (7,000) people, have been founded and developed in reliance upon the said right of appropriation, and are largely dependent for their prosperity upon the maintenance of the said canal; and that there are living on farms lying under the said canal, and irrigated therefrom, about four thousand (4,000) people.

Moreover, this defendant avers that a large portion of the land lying under the said canal and irrigated therefrom was acquired as to title from the United States Government under the act approved March 3, 1877, known as "the desert land act," which declared that all waters of all lakes, reservoirs and other sources of supply upon the public land should remain and be held free for the appropriation and use of the public for irrigation, mining and manufacturing purposes; and in and by which it was also provided that by the construction of canals and ditches, and the application of said waters to the irrigation of the public lands, the title to said lands might thereby be obtained from the United States.

This defendant further alleges that it and its predecessors in interest, and the consumers of water from the said canal, have ever since the construction thereof used and enjoyed the said appropriation of water for the irrigation of crops lying under the said canal, unchallenged by any one, and without denial or interference. The construction thereof was a matter of public history, notoriously

known to all well informed people living in the valley of the Arkansas river, both in the State of Colorado and the State of Kansas; and the original construction thereof and its subsequent extension was largely promoted and carried on by the aid of various citizens of the State of Kansas, who were and are now owners of riparian lands along the said river in the State of Colorado, and who desired to bring their said lands under cultivation by means of the said canal enterprise; and at all times prior to the institution of this suit have the proprietors of lands riparian to the said river as the same runs through the State of Kansas, assented thereto and acquiesced therein.

This defendant further alleges that if it should be compelled by this honorable court to discontinue its diversion of water from the said Arkansas river, as it and its predecessors in interest have practiced the same for the last twenty years past under authority of the constitution and laws of the State of Colorado, and pursuant also to the policy of the Government of the United States relative to the development and improvement of its arid lands,—great and irreparable wrong and injury would thus be done to the consumers of water thereunder, to the extent that their crops would necessarily be destroyed and their investments rendered valueless, and the said lands would necessarily revert to their former arid state.

And this defendant invokes the benefit of an equitable estoppel against the complainant, The State of Kansas, as well as all other riparian proprietors whom it claims to represent and in whose interest it has filed its bill of complaint, in respect to the matters and things therein charged.

II.

This defendant for further answer to the bill of complaint, says:

1. The appropriation of the waters of the Arkansas river so made by this defendant, and complained of in said bill of complaint was made in accordance with and in reliance upon the doctrine respecting the appropriation of the water of the natural streams for irrigation and other beneficial uses which, by usage and custom prevailed in the arid region of the United States at the time of said appropriation, and which, by the recognition and approval of the United States, has at all times been the law applicable to the public lands in said arid region.

2. Prior to the acquisition of private title to any of the lands acquired by the General Government from France, Mexico and Texas by purchase, cession and annexation, respectively, comprising all the lands now within the jurisdiction of the United States between the Mississippi river and the Pacific coast, said General Government caused said lands to be explored and reported upon for the purpose of ascertaining the natural resources and the physical and climatic characteristics of the various portions thereof, and by said explorations and information obtained from time to time, it become known to the United States and the inhabitants thereof that from about

the 97th meridian to the coast range of the Pacific slope, the land was an arid waste without timber of useful vegetation, except in the mountains, and that although the soil was rich and fertile, and great deposits of gold, silver and other valuable minerals existed therein, the soil could not be made productive nor the minerals extracted, nor could the land be inhabited, except by the diversion of water from the natural streams and the application thereof to agricultural and mining uses, and that in that portion of said domain which lay south of the Arkansas river, and which had formerly been a part of Mexico, the laws, customs and usages there prevailing authorized and sanctioned the diversion and use of water for agricultural and other useful purposes in contravention of any right of the riparian owner to have such water continually flow in its natural channel.

3. With the earliest settlement in said arid region for agricultural and mining purposes, which was long prior to the opening of said lands to preëmption and purchase, by necessity, common consent and uniform practice, the doctrine obtained that the waters of all the natural streams flowing through said arid region were subject to diversion and use for agricultural and mining purposes, and that the right to the water thus diverted could be obtained both as against the United States as the owner of the public lands and all grantees of the United States of lands lying along said streams, and that the right of the several appropriators from any given stream should be in the order of diversion and use, the first in time being first in right, and said doctrine has at all times been and now is the customary and statute law of said arid region in respect to the natural streams thereof.

With knowledge and in recognition of such right and custom of the inhabitants of such arid region to divert waters, and to apply the same to beneficial and necessary uses, the United States, in its treaty with Spain of February 22d, 1819, and afterwards in its treaty of January 12th, 1828, with the United Mexican States, expressly stipulated and provided, that the use of the waters of the Arkansas river, and of certain other boundary streams should be common to the respective inhabitants of both nations, parties to such treaties respectively.

4. Upon the creation and admission of the several Territories and States of said arid region, including Kansas, both as a Territory and State, they recognized, approved and confirmed, and from thence hitherto have enforced said doctrine, and rights to water by diversion from the streams of said arid region have been maintained as against all claims of riparian rights in conflict therewith.

5. The Government of the United States, long prior to the sale by it of any of the public lands in the Arkansas valley, recognized and approved said doctrine, and applied the same to said public lands, and renounced and surrendered all riparian rights which it might have asserted in contravention of said doctrine, and from thence hitherto has held and disposed of said lands subject to and in ac-

cordance with said doctrine, and has at all times encouraged and promoted the diversion and use of the water of the streams in said arid region for agricultural and mining purposes, and by grants of public money has aided in the construction of canals, ditches and reservoirs and other appliances for the diversion, storage and use of water, in the reclamation and cultivation of the public lands.

6. By an act of Congress, approved September 4, 1841, and by subsequent acts relating thereto, the public lands, including the lands in said arid region were declared subject to pre-emption and homestead purchase, and all persons desiring to avail themselves of the provisions of said acts were required to make a settlement upon the land in person and to inhabit and improve the same. It was then, and at all times since has been well known to the General Government, and particularly to Congress and the executive departments having in charge the administration of said acts, that the provisions thereof in respect to settlement, inhabitancy and improvement could not be complied with in the pre-emption and purchase of arid lands, except by the diversion of the waters of the streams upon the public lands and the application thereof to domestic and irrigation purposes in reliance upon the continuance of the right so to do in accordance with said doctrine of appropriation.

7. By means of the diversion and use of the waters of said natural streams, many million acres of the public lands in said arid region have been settled upon, inhabited and improved and title thereto obtained from the General Government; in the belief that by its action and conduct in the disposition of its public lands, the United States had accepted and applied to said public lands the doctrine of appropriation as hereinbefore set forth; and there has been paid to said General Government, on account of said lands so improved by the diversion and use of water in accordance with said doctrine, upwards of twenty million dollars, and all of the lands in the valley of the Arkansas in the State of Colorado, save and except certain Indian lands, were settled upon and patents therefor obtained by proof of the diversion and use of the waters of said Arkansas river in the reclamation and improvement of said lands, said diversions so made being those complained of and sought to be enjoined in and by the bill of complaint herein.

8. The Territory of Kansas by its legislature, recognized and approved the said doctrine of appropriation, and in pursuance thereof in 1859 authorized the St. Charles Town Company to divert the waters of the South Platte river and Cherry creek, and the Mountain Company to divert the waters of the Platte river, and the El Paso Town Company to divert the waters of the tributaries of the Arkansas river heading at Pike's peak; and in 1860 authorized the Capital Hydraulic Company to divert for irrigation purposes all the waters of the South Platte river and Cherry creek. And the State of Kansas, by its legislature, has also recognized, approved and adopted said doctrine; an act of said legislature enacted in 1868, authorizing corporations to construct canals diverting water for irrigation

purposes; an act of the legislature enacted in 1886 providing that the running waters of the State might be appropriated for purposes of irrigation; an act of said legislature enacted in 1891, providing that in all that portion of the State west of the 99th meridian all natural waters, whether standing or running and whether surface or subterranean, should be devoted first, to purposes of irrigation in aid of agriculture, subject to ordinary domestic uses; and, second, to other industrial purposes, and might be diverted from natural beds, basins or channels for such purposes and uses; and another act enacted in 1895 providing for the development of the land west of the 98th meridian by irrigation and regulating the distribution of water in the same manner as in Colorado. Said State by said several acts renouncing and surrendering all rights it may have had in said river or the lands adjacent thereto as riparian owner in contravention of the right to divert the waters thereof for irrigation in Kansas or Colorado.

And in reliance upon the approval and adoption of said doctrine of appropriation by said State of Kansas, about five hundred miles of large canals and ditches have been constructed in Kansas, west of the 97th meridian at a cost approximating two million dollars and thereby the waters of said Arkansas river have been appropriated and applied to about one hundred and fifty thousand acres of land in the valley of said river, in the State of Kansas.

9. By the act of Congress approved January 29th, 1861, admitting Kansas into the Union, it was specifically provided that the State should never interfere with the primary disposal of the soil within the same by the United States, or with any regulations Congress might find necessary for securing the title in said soil to *bona fide* purchasers thereof, and that all laws of the United States not locally inapplicable should have the same force and effect within said State as in other States of the Union.

10. Following the admission into the Union of the State of Kansas, said doctrine of appropriation was further recognized by Congress as the law applicable to the public lands and the natural streams thereof, including those in the State of Kansas, by the following acts:

An act approved July 26, 1866, by which it was provided that whenever, by priority of possession, rights to the use of water for mining, manufacturing or other purposes, have accrued and are recognized according to local customs, laws and decisions, the owners and possessors shall be maintained and protected in their rights;

An act approved July 9, 1870, in which it was provided that all patents granted, or pre-emptions or homesteads allowed, should be subject to any vested and acquired water rights or rights to ditches and reservoirs used in connection with such water rights;

An act approved March 3, 1877, known as "the desert land act," which declared that all waters of all lakes, reservoirs and other sources of supply upon the public land should remain and be held free for the appropriation and use of the public for irrigation, min-

ing and manufacturing purposes, and in and by which it was also provided that by the construction of canals and ditches and the application of said waters to the irrigation of the public lands, the title to said lands might thereby be obtained from the United States;

An act approved March 3, 1891, confirming the rights of way over the public lands in the arid region for canals and reservoirs for irrigation purposes;

An act approved August 18, 1894, providing for the conveyance to the several States in the arid region of such public lands as they might reclaim and irrigate;

An act approved June 17, 1902, authorizing and undertaking the construction of canals, ditches and reservoirs in the arid region, including therein the State of Colorado and the western portion of Kansas, whereby the waters of the public lands might be diverted and used for irrigation purposes, and appropriating for that purpose the proceeds of all moneys received from the sale of public lands in the States of Colorado and Kansas.

Under and by virtue of said act approved March 3, 1877, which was made applicable to lands in Colorado by an act approved March 3, 1891, several thousand acres of land in the Arkansas valley in the State of Colorado, were reclaimed and irrigated, and the diversions of water for said purposes are in part the diversions complained of in the said bill of complaint.

11. Said doctrine was further recognized by Congress by the appropriation, on October 2d, 1888, of $229,000 for the purpose of investigating the extent to which the arid region of the United States might be redeemed by irrigation and for the segregation of the irrigable lands in such arid region, and for the selection of sites for reservoirs and other hydraulic works necessary for the storage and utilization of water for irrigation, and also by a further appropriation made on March 2d, 1889, of $450,000 for the like purpose, all of which moneys were expended in investigating and selecting reservoir sites and in running contour lines for the purpose of aiding and assisting those desiring to appropriate the waters of the natural streams and using the same for irrigating purposes.

12. The provisions of the constitution of the State of Colorado set forth and complained of in the bill of complaint, were adopted in harmony with and in pursuance of the policy of the United States in respect to the diversion and use of water in the irrigation of land, and the same do not conflict with or contravene any act of Congress bearing upon said appropriation and use, but, on the contrary, are intended as a constitutional guaranty that the right to divert water for beneficial purposes as authorized and encouraged by the acts of Congress referred to shall never be denied, and said provisions were accepted and approved by the action of Congress in admitting Colorado into the Union, and the several acts of the legislature of Colorado, referred to in said bill of complaint, have been enacted for the purpose of protecting and regulating appropriations made in pursuance of the usages and customs prevailing in the arid region and

the rights of appropriation as recognized and confirmed by the acts of Congress referred to.

13. All grants and patents of land in the valley of the Arkansas, in the State of Kansas, were made by the United States, subject to the doctrine of appropriation heretofore set forth, and were accepted by the several grantees thereof with the knowledge that in the sale and disposition of the arid lands of the United States along said Arkansas river west of the 97th meridian, it had been and would be necessary to divert and use the waters of said river in the improvement and cultivation thereof, and said grants and patents of lands in the State of Kansas were made subject to the right of all persons desiring the use of the same for agricultural purposes to appropriate the waters of the Arkansas river, either in Kansas or Colorado, to the full extent of said river, and all patents granted and all preemptions and homesteads allowed of lands in the valley of the Arkansas in the State of Kansas subsequent to July 9th, 1870, including in particular the lands described in the bill of complaint situated in Ford county, conveyed to said State of Kansas by the United States on the 13th day of June, 1889, and the lands in Reno county described in said bill of complaint conveyed to the said State of Kansas at divers times subsequent to said 9th day of July, 1870, were, by the act of Congress of July 9th, 1870, made subject to all water rights in said river and rights of ditches and reservoirs in connection therewith acquired in accordance with the local customs, laws and decisions of Colorado.

III.

This defendant for further answer saith,

That at all times, the State of Kansas, and the inhabitants thereof, well knew that, commencing in said State at about the 97th meridian, and thence continuing westward to the Rocky mountains, the land was arid and incapable of being settled upon or cultivated, except by the diversion and use of the waters of the natural streams, and that diversions of the waters of the Arkansas river were being made for the purpose hereinbefore set forth, and that such diversions were made under a claim of right to the continued use of the waters of said river as against all owners of land in the valley of the Arkansas throughout its entire length, and that the settlement of said valley in the State of Colorado and the expenditure of amounts aggregating many millions of dollars in the construction of canals, ditches and reservoirs, and in lands, buildings and improvements, and in houses, stores, factories, and public and private buildings, was made in reliance upon the right to divert the waters of said river and to continue such diversion in perpetuity.

Prior to the filing of the bill of complaint herein, neither the State of Kansas, nor the owners of lands in the Arkansas valley in said State, complained of said diversions, nor the right to make or continue the same, nor in any way or manner claimed or alleged any right upon the part of said State, or the owners of land in said val-

ley, to the flow of said river as it had been accustomed to flow prior to the making of said appropriations; but, on the contrary, the said State approved the diversion of water from said river and affirmed the right to make the same in the reclamation and irrigation of the lands along said river, by an act of the legislature of said State, enacted in 1886, authorizing and providing for the like diversion and use of the waters of said river in the State of Kansas, and by a further act, enacted in 1891, declaring that in that portion of the State of Kansas west of the 99th meridian all natural waters, whether running or standing, and whether surface or subterranean, should be devoted, first, to the purposes of irrigation in aid of agriculture; and, second, to other industrial purposes, and that said waters might be diverted from natural beds and channels for such purposes and use, and the owners of land in said valley in said State recognized and approved said appropriations, and the right to continue the same, by themselves constructing above five hundred miles of canals and ditches, and diverting the waters of said river for the irrigation of about one hundred and fifty thousand acres of land, and claimed the right so to do as against all owners of lands along the course of said river in Kansas or elsewhere.

The said State of Kansas and the owners of land in the valley of the Arkansas, in said State, have at all times acqui-sced in the appropriation of the waters of the Arkansas river in the State of Colorado, and have waived, surrendered and relinquished any and all riparian rights now claimed by them, and by their delay in the filing of the complaint herein have caused the several appropriators of water from said river in Colorado to make the expenditures hereinbefore mentioned, and the people in said valley to settle upon, improve and cultivate the lands, and to build towns and cities, and for that purpose to expend the sums hereinbefore mentioned; and they are now estopped, by their conduct and delay, from asserting or maintaining any of the rights claimed in the said bill of complaint, and each and every owner of land in said valley in the State of Kansas who might claim rights adverse to the appropriations of water from said river in Colorado, are by the statutes of said State of Kansas barred from asserting such rights as against ditches and canals constructed and appropriations made in the State of Colorado fifteen years or more prior to the filing of the bill herein.

This defendant, now having fully answered all the allegations in the plaintiff's amended bill of complaint, or so much thereof as the defendant is advised should be answered, asks to be h ence dismissed with its cost and charges in this behalf sustained.

{Seal of the Fort Lyon Canal Company, Las Animas, Colo., Incorporated 1897.}

CHAS. E. GAST,
H. L. LUBERS,
Solicitors for the Fort Lyon Canal Company, Defendant.

[Endorsed:] Supreme Court U. S. October term, 1903. Term No. 7, original. The State of Kansas, complainant, vs. The State of Colorado *et al.* Answer of Fort Lyon Canal Company to amended bill. Filed Nov. 2, 1903.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant, vs. THE STATE OF COLORADO, THE ROCKY FORD Canal, Reservoir, Land, Loan and Trust Company, The Catlin Consolidated Canal Company, The Oxford Farmers' Ditch Company, The Lake Canal Company *et al.*, Defendants.	Original Proceeding No. 7.

Joint and several answer of the defendants, The Rocky Ford Canal Reservoir, Land, Loan and Trust Company, The Catlin Consolidated Canal Company, The Oxford Farmers' Ditch Company, and The Laguna Canal Company (in the amended bill by mistake called The Lake Canal Company), to the amended bill of complaint of the State of Kansas.

Fred A. Sabin, solicitor of the Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, the Catlin Consolidated Canal Company, the Oxford Farmers' Ditch Company, the Laguna Canal Company.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant, vs. THE STATE OF COLORADO, THE ROCKY FORD Canal, Reservoir, Land, Loan and Trust Company, The Catlin Consolidated Canal Company, The Oxford Farmers' Ditch Company, The Lake Canal Company *et al.*, Defendants.	Original Proceeding No. 7. October Term, 1903.

Joint and several answer of the defendants, The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, The Catlin Consolidated Canal Company, The Oxford Farmers' Ditch Company, and The Laguna Canal Company (in the amended bill by mistake called The Lake Canal Company) to the amended bill of complaint of the State of Kansas, complainant.

These defendants, and each of them, now and at all times hereafter saving to themselves all and all manner of benefit or advantages of exception or otherwise that can or may be had or taken to

the many errors, uncertainties and imperfections in the said bill contained, for their joint and several answer thereto, or to so much thereof as they are advised it is material or necessary for them to answer to, answering, say:

I.

1. These defendants admit that the rise, course, drainage area and general physical characteristics of the Arkansas river and of the valley thereof, except as hereinafter set forth, are as stated in said amended bill of complaint.

2. These defendants deny that the said Arkansas river is in fact, or within the laws or departmental rules and regulations of the United States, a navigable stream either within the State of Colorado or the State of Kansas.

3. These defendants deny that any diminution of the flow of said river from the State of Colorado into the State of Kansas is wholly or mainly attributable to the diversion of the waters of said river in the State of Colorado; and deny that the normal flow of said river at the State line, in the absence of irrigation, for ten months, or for any considerable period during the year, is upward of two thousand cubic feet per second, or any amount in excess of five hundred cubic feet per second.

4. These defendants admit that the ordinary and usual rainfall in the valley of said river west of the 98th meridian is inadequate for the growing and maturing of cultivated crops; and allege that in that portion of the State of Kansas the inhabitants thereof have resorted to and are now practicing the method of appropriating the water from said river and using the same for the irrigation of lands that for more than forty years has been practiced in the State of Colorado.

5. These defendants deny that from time immemorial, or at all, the waters of said river have flowed through underlying sand and gravel extending in width under the entire valley of the Arkansas river or any material portion thereof; and deny that any part of the course and flow of said river is beneath the surface of the bottom lands of the valley, or that the course or flow thereof is of any greater width than the channel of said river between its banks, or that there is any underflow of water coextensive with the valley of said river passing from the State of Colorado into the State of Kansas or in or through said State of Kansas; and these defendants deny that the alleged underground waters of said river furnish sufficient moisture to grow ordinary farming crops in the absence of rainfall, unless supplemented by water applied by a system of irrigation such as is in use in Colorado and in the western part of Kansas.

6. These defendants deny that the flow of the river or the underground waters, to any appreciable extent, tends to cool or moisten the surrounding atmosphere, promote the growth of vegetation, enhance the value of lands or conduce directly or materially to the public health or the habitability of the valley; and allege that such

results throughout the arid and semi-arid portions of Kansas can be produced only by the diversion of water from the river and the application of the same by a system of irrigation to the adjoining lands, and the cultivation thereof.

7. These defendants deny that the value of lands in the valley of the Arkansas in said State of Kansas is in any degree dependent upon the natural and normal flow of water in said river, and deny that the acts alleged to have been done by this defendant are wrongful; and deny that by reason of said alleged wrongs, or otherwise, the value of lands in the valley of the Arkansas river in the State of Kansas has been diminished in any sum whatever, or that the revenue of the State of Kansas arising therefrom has been or will be in any wise injuriously affected.

8. These defendants admit the acquisition by the State of Kansas of the lands mentioned in said bill of complaint and the conveyance of certain portions thereof to the grantees mentioned therein; and allege that all of said lands so acquired by said State of Kansas and held by its grantees, as well as all lands acquired by settlers by homestead, pre-emption or purchase, were at all times, and are now, subject to the riparian rights of other proprietors of lands in the valley of the Arkansas higher up said stream and to the right of other proprietors of land in said valley to appropriate the waters of said river and use the same in the irrigation thereof both in Colorado and western Kansas.

9. These defendants deny that the Arkansas river is now, or at any time has been, a navigable stream in the State of Kansas, or treated as such, or that the title to the bed of said river in the State of Kansas ever passed to said State, or that said State now is or ever has been the owner thereof or entitled to the control thereof, or has ever attempted to control the same save and except as by an act of the legislature of the State of Kansas, passed in 1886, it declared that the right to the use of running water flowing in a river or stream of Kansas, for the purposes of irrigation, might be acquired by appropriation; and by a like act, passed in 1891, declared that in that portion of the State west of the 99th meridian, all natural waters, standing or running, should be devoted first to purposes of irrigation in the aid of agriculture, subject to ordinary domestic uses; and secondly, to other industrial uses, and that the same might be diverted from the natural beds, basins or channels for such purposes and uses; and as, by a like act subsequently passed, it enlarged and extended the right to use the natural waters of said State for irrigation purposes eastward to the 98th meridian.

10. These defendants have no knowledge of the several conveyances or grants of land in the valley of said river in the State of Kansas heretofore made by the Government of the United States, except as hereinafter set forth, and aver that all of the conveyances or grants referred to in said bill of complaint, including in particular the lands alleged to be owned by the State of Kansas, were made subject to all rights to water from said river for irrigation purposes

theretofore and thereafter to be acquired, and were taken with full knowledge on the part of said State of Kansas, and by each and every grantee of said lands, that the waters of said river had been, were being and would be appropriated in the State of Colorado for beneficial uses in the irrigation of land, and that the land in said valley in the State of Kansas west of the 98th meridian and in the State of Colorado could only be made available for agricultural purposes by like appropriation and use, and that the Government of the United States, as the primary owner of said lands, had assumed that it held the same subject to the appropriation of the waters of said river for irrigation purposes, and that all patents of land granted after July 9th, 1870, should be subject to all vested and acquired water rights in or over said river.

11. These defendants deny that the lands alleged in said bill of complaint to belong to the State of Kansas and situated in the counties of Ford and Reno depend for their value for farming purposes upon the flow of water in the bed of said river or upon the underflow beneath said land, or that they are entitled to the full, free and natural flow of said waters which would naturally flow in said river to or beneath said land; and deny that the rights of the State of Kansas as the owner thereof are prior or superior to the rights of these defendants or of the lands irrigated by their canals as hereinafter more particularly set forth.

12. These defendants deny that the diversion of the waters of the Arkansas river by these defendants and the use thereof in the irrigation of the lands lying under their canals in any degree whatever diminishes the ordinary and usual flow of the water in said State of Kansas, and on the contrary allege that, as a result of irrigation in the valley of the Arkansas in the State of Colorado, the lands irrigated act as reservoirs for the storage of the ordinary and usual flow of said river and of the flood and storm waters thereof, returning the waters not used by plant life or lost by evaporation to the bed of the river by the natural and ordinary process common to lands having abundant rainfall, and the average flow of water into said State of Kansas, outside of flood and storm periods, is thereby increased instead of diminished.

13. These defendants deny that they are carrying any of the waters of said river through their canals to lands not riparian to said river in the sense given to the word "riparian" in the bill of complaint, and allege that all of the lands under their said ditches and canals are within the water shed of said river.

14. These defendants deny that when the Territory of Kansas was created or the State of Kansas admitted to the Union, the water of said Arkansas river was wholly unappropriated, or that the common law and the riparian rights claimed in said bill of complaint extended over said valley in the State of Kansas, or that the owners of lands along said river were entitled to the unimpeded flow of the water of said river; but on the contrary aver that numerous appropriations of said water had been made for irrigation purposes long

prior to the creation of said Territory and many more were made prior to the conveyance by the Government of the United States of any of the lands lying along or adjacent to said river, and that the necessity and right to divert the water of said river for the reclamation of arid land had, long previous to the creation of said Territory, been asserted and exercised by persons in possession of said lands, and said necessity and right were thereafter recognized by the legislature of the Territory of Kansas, and all lands along said river acquired by the State of Kansas, or by individuals or corporations within the Territory or State of Kansas, were taken and held with full knowledge of the climatic conditions which made necessary the diversion of the waters of the said river west of the 98th meridian, and that appropriations had been, were being and would be made west of the 98th meridian within the State of Kansas and Colorado, and that to the extent of said appropriations the flow of water of said river might, by the laws, usages and customs then prevailing, be lawfully impeded.

15. These defendants deny that by their taking of water from said river in the State of Colorado through their canals and the use thereof in the irrigation of lands lying thereunder the State of Kansas, or any of its citizens, or the owners of land along said river in the State of Kansas, have been injured in any degree whatever, or that the fertility of the lands or the use thereof to the fullest extent to which the same are naturally capable of use, have been diminished or impaired, or that the crops, trees or vegetation growing along said river have perished or will perish, or that the wells have become or will become dry, or that the salubrity or healthfulness of said valley, or of the lands adjacent to said river, have been or will be impaired.

II.

These defendants, for further joint and several answer and defense to the amended bill of complaint, say:

1. During the year 1869, the Ballow Hill Ditch Company, a corporation, constructed an irrigating ditch, called "the Ballow Hill ditch," in Pueblo county, Colorado, with its headgate located on the north bank of the Arkansas river in section six (6), township two (2), south of range sixty-two (62), west of the sixth principal meridian, said ditch being about four miles in length. Said ditch was built for the purpose of reclaiming and irrigating certain waste and arid lands lying thereunder and riparian to said river, and on July 1, 1869, an appropriation of water from said river for said purpose was made by said company to the amount of sixteen cubic feet of water per second of time which said appropriation has been continuously used since said date and to the present time. Thereafter, in the year 1885, said corporation enlarged said canal and extended the same to a length of about twelve miles and, during the month of June, 1895 made a further appropriation of water from said river of thirty cubic feet of water per second of time, which said appropriation has been used continuously since that date to the present time.

2. During the year 1886 there was constructed another irrigating ditch known as "the Allen ditch" with its headgate located on the south bank of the Arkansas river in the northeast quarter (N. E. ¼) of section seventeen (17), township twenty-one (21), south of range sixty-one (61), west of the sixth principal meridian in Pueblo county, Colorado. Said ditch was about one and one-half miles long and built for the purpose of irrigating and reclaiming certain waste and arid lands which were riparian to the Arkansas river and located on the south bank thereof. There was diverted from said river and appropriated for the purpose of irrigating said lands through said ditch, on the 11th day of March, 1886, two cubic feet of water per second of time, and thereafter, in January, 1890, the further amount of two and one-half cubic feet of water per second of time, both of which appropriations have been continuously used since they were originally made and up to the present time.

3. This defendant, The Rocky Ford Canal, Land, Loan and Trust Company, was organized under the laws of the State of Colorado in 1889, for the purpose among other things, of acquiring and becoming the owner of the right to appropriate and take water from the Arkansas river and its tributaries and for the purpose of constructing reservoirs for the impounding of said waters and a canal for the delivery thereof to farmers and others living thereunder for the irrigation of lands and for domestic purposes, each of the persons so receiving water from said canal to be a stockholder therein and to receive a certificate of stock entitling him to the use of a certain portion of the water flowing through said canal.

4. Pursuant to the purposes of its organization this defendant, The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, in 1889, constructed and now owns a canal known as "the Rocky Ford Highline canal," the same being located on the south side of the Arkansas river in the counties of Pueblo and Otero, in the State of Colorado, with its headgate at the point of location of the headgate of the Allen ditch hereinbefore described. On the 6th of January, 1890, by means of said canal, this defendant, The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, appropriated and diverted water from the Arkansas river to the amount of four hundred twenty-two and one-half cubic feet per second, and applied the same to beneficial uses for irrigation, to the lands under said canal. Said canal is seventy-eight miles long and twenty feet wide on the bottom at its headgate, and cost, in its original construction, $225,000, and $78,000 more has been expended by its present owner in improvements thereon and in the purchase of priorities, since its original construction.

5. On March 23, 1896, the district court of Pueblo county, Colorado, it having jurisdiction in the premises, in a matter there pending, entitled "In the matter of priority of water rights in district No. 14," decreed a priority for sixteen cubic feet of water per second, of date July, 1869, and a further priority for thirty feet per second, of date, June 1885, to be carried through the said Ballow Hill ditch, and, at the

same time, decreed a priority for four hundred and twenty-two and one-half cubic feet of water per second of time, to be carried through the Rocky Ford Highline canal, two cubic feet thereof being of date March, 1886, and four hundred and twenty and one-half cubic feet thereof being of date January, 1890, all of which priorities the defendant, The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company now owns.

6. During the year 1901 a decree of the district court of Pueblo county, Colorado, was entered, adjudging and decreeing the transfer of said rights of appropriation from the Ballow Hill ditch to the Rocky Ford Highline canal, said decree having been made under and by virtue of the provisions of an act of the General Assembly of the State of Colorado entitled "An act in relation to irrigation," approved April 6, 1899. After the transfer of said priorities said Ballow Hill ditch was abandoned and has not since been used for irrigation purposes.

7. During the year 1884, the Catlin Land and Canal Company, a corporation, constructed an irrigating ditch called "the Catlin ditch" in Otero county, Colorado, with its headgate located on the south bank of the Arkansas river at its confluence with the Apishapa river, one of its tributaries. Said ditch was built for the purpose of reclaiming and irrigating certain waste and arid lands lying thereunder and riparian to the Arkansas river, and, on the 3rd day of December, 1884, an appropriation of water from said river for said purpose was made by said company to the amount of two hundred and forty-eight cubic feet per second, which said appropriation has been continuously used since that date by said defendant and its predecessor in title.

8. During the year, 1887, the Fairmount Lateral and Reservoir Company, a corporation, constructed an extension of said Catlin ditch, making said ditch as extended forty-eight miles long. Said extension was built for the purpose of reclaiming and irrigating certain waste and arid lands lying thereunder and riparian to said river, and on November 14, 1887, a further appropriation of water from said river for said purpose was made by said company to the amount of ninety-seven cubic feet per second, which said further appropriation has been used continuously since that date by this defendant and its predecessor in title.

9. This defendant, The Catlin Consolidated Canal Company, was organized as a corporation under the laws of Colorado, November 7, 1892, for the purpose, among other things, of acquiring title to the Catlin ditch and the said extension thereof and becoming the owner of the rights of appropriation of the waters of said river belonging thereto and for the purpose of delivering said water to farmers and others living thereunder for the irrigation of lands and for domestic and irrigation purposes. Pursuant to the purposes of its organization said defendant, on the 27th day of December, 1892, purchased said canal and the extension thereof, and all rights of appropriation of water belonging thereto, and ever since has been and now is the

owner thereof. In the construction of said canal and extension more than $100,000 has been expended by said defendant and its predecessors in title.

10. In the year 1867, the predecessor in title of this defendant, The Oxford Farmers' Ditch Company, constructed an irrigating canal in Pueblo county, Colorado, on the south bank of the Arkansas river, having its headgate in section thirty-one (31), township twenty-one (21), south of range sixty (60), west of the sixth principal meridian, said canal being known as the "Enterprise ditch," and, on the 1st day of March, 1867, appropriated water to the amount of twenty-eight cubic feet per second from said river and applied the same to the lands lying under said canal for irrigation purposes, which said appropriation of water has been used continuously by this defendant and its predecessor in title since it was originally made and until the present time.

11. During the year, 1887, the predecessor in title of the defendant, The Oxford Farmers' Ditch Company, constructed a certain irrigating canal known as "the Oxford Farmers' ditch" in Pueblo and Otero counties, in the State of Colorado, using the line of the said "Enterprise ditch" and straightening, enlarging and extending the same, the headgate thereof being located at the point of location of the headgate of the said "Enterprise ditch" and, on the 26th day of February, 1887, appropriated an additional one hundred and sixteen cubic feet of water per second from the Arkansas river by means of said canal and applied the same to lands lying thereunder, which said appropriation of water has been used continuously since that date and until the present time by this defendant and its predecessor in title.

12. This defendant, The Oxford Farmers' Ditch Company, was organized as a corporation under the laws of Colorado, on the 11th day of October, 1888, for the purpose, among other things, of owning and operating a canal for the purpose of conveying waters from the Arkansas river for use by the stockholders of said company in irrigating the lands under said canal, and, pursuant to the purposes of its organization, during the year 1888, it became the owner of the said "Oxford Farmers' ditch" and all its rights to appropriate water from said river, and has been and now is the owner thereof. There has been expended in the construction of said ditch by its present owner and its predecessor in title over $60,000.

13. During the year 1889 one Henry R. Holbrook commenced the construction of an irrigating canal called the "Lake canal" in Otero county, Colorado, with its headgate located on the north bank of the Arkansas river in section twenty-four (24), township twenty-two (22), south of range fifty-eight (58), west of the sixth principal meridian. Said ditch is about twenty-five miles in length and has a carrying capacity of five hundred and fifteen cubic feet of water per second, and was built for the purpose of reclaiming and irrigating certain waste and arid lands lying thereunder. Of date the 25th day of September, 1889, appropriations of water from said river,

for said purpose, have been made by means of said canal, to the amount of five hundred and fifteen cubic feet per second, and the appropriations so made have been used continuously until the present time.

14. This defendant, The Laguna Canal Company, was organized as a corporation under the laws of Colorado July 11, 1892, for the purpose, among other things, of acquiring and becoming the owner of the Lake canal and of the reservoir sites and rights to appropriate and take the waters of the Arkansas river and its tributaries, belonging thereto, and also for the purpose of constructing reservoirs for impounding said waters, the same to be delivered to farmers and others living under said canal, for the irrigation of lands and for domestic purposes. Pursuant to the purposes of its organization, said defendant in 1892 purchased said canal and all reservoir sites and rights of appropriation of water belonging thereto and is now the owner thereof.

15. During the year 1894 this defendant, The Laguna Canal Company, developed and constructed a reservoir called "Reservoir number one," the same being fed from the Arkansas river by means of the Lake canal. Water is delivered from said reservoir to lands thereunder for purposes of irrigation by means of an outlet canal about fourteen miles in length. The cost of said canal, reservoir and outlet canal was $150,000.

16. The Rocky Ford Highline canal, the Catlin ditch and the Oxford Farmers' ditch are situated on the south bank of the Arkansas river in the counties of Pueblo and Otero, in the State of Colorado, and covers an area of about two hundred square miles, said area having a population of more than eight thousand people. Prior to the construction of said canals said lands were an arid and barren waste fit only for grazing purposes, the amount of rainfall in said locality being insufficient for the cultivation of crops and insufficient to render said territory habitable. Since the construction of said canals all of said territory, except that portion thereof, the topography of which renders it non-irrigable, has been reclaimed and redeemed from its former arid and barren condition by the application of water from said river and its use in irrgating said lands and cultivating the same and in growing crops thereon.

17. With the construction of said canals settlers began to locate on said lands and to acquire title thereto and cultivate the same and to build homes, set out orchards and make other permanent improvements. Cities and towns sprung up, and the city of Rockyford and the towns of Manzanola and Fowler are now located in said territory. The city of Rockyford is a city of the second class, created such under the laws of Colorado, and has a population of about twenty-five hundred people. In it are located many churches and school houses and other public buildings. Residences and business houses have been constructed and a factory for the manufacture of beet sugar was erected at an expense of about $750,000, in the year 1900.

18. The towns of Manzanola and Fowler are incorporated under the laws of Colorado, each with a population of about four hundred and fifty people and in them are also located school houses, churches and many residences and business houses. The said city of Rocky-ford and the said town of Manzanola are in part dependent upon the Rocy Ford Highline canal and the Catlin ditch for their water supply for domestic purposes, and said municipalities are owners of water rights in said canals and use the same continually for the purpose of supplying their inhabitants with water. Property values to the amount of three and one-half millions of dollars have been created under said canals by means of the construction thereof and the use of the same in applying water to said lands. The lands have become fertile and productive and capable of yielding and do yield, annually, abundant crops of fruit, grains, alfalfa, sugar beets, melons and other vegetables. The value of said property depends entirely upon the right to divert the waters from said river and apply the same to agricultural and domestic purposes and if these defendants are enjoined from diverting and delivering said water, the communities under said ditches will be depopulated and destroyed, said improvements rendered valueless and said lands return to their former barren and unproductive condition.

19. Lying under said lake canal and said reservoir number one, owned by this defendant, The Laguna Canal Company, and susceptible of irrigation therefrom, are twenty-two thousand acres of land, and water has been applied to seventeen thousand acres thereof for the raising of crops. Prior to the construction of said canal and reservoir said lands were waste and vacant lands, but by means of the construction of said canal and the use thereof, in applying the waters of said river to the lands lying thereunder, said lands have been rendered fertile and productive, and large crops of fruit, grain, alfalfa, melons, sugar beets and other vegetables are raised annually thereon; school houses, churches, dwelling houses and other buildings have been built; and there are now living under said canal and dependent thereon for their water supply for domestic and irrigation purposes six hundred people, who have created property values by means of said canal to the amount of over six hundred thousand dollars. The value of said property depends entirely upon the right to divert water from said river and apply the same to said lands for agricultural and domestic purposes; and if this defendant, The Laguna Canal Company, is enjoined from diverting and delivering said water, the community under said ditch will be destroyed, said improvements rendered valueless and said lands return to their former barren and unproductive state.

20. The said canals were constructed and used in appropriating and applying waters from the Arkansas river for irrigation purposes and said lands were settled and said property values created by these defendants, their predecessors in title and the settlers on said lands, in reliance upon the laws, customs and usages prevailing in the States of Kansas and Colorado respecting the diversion and use

of the waters of said States, and in the belief that it was the desire and policy of said State of Kansas and of the inhabitants and owners of lands in the valley of the Arkansas in said State, that the lands in said valley should be reclaimed and made fruitful and productive by irrigation, and in the further belief that all claims to riparian rights, contrary to or in derogation of the right to divert waters of said river for irrigation purposes had been surrendered and relinquished by said State and by the several owners of lands in said valley.

21. For many years prior to 1882 it was believed and generally claimed by the people living in the valley of the Arkansas river in Kansas and Colorado that there was sufficient rainfall for the cultivation of crops throughout the said valley in Kansas and for many miles westward into Colorado. Following the year 1882 and until the construction of ditches, canals and reservoirs for irrigation purposes there was a constant failure of crops due to the insufficient rainfall, and a large part of the population, which had settled along said river on the strength of the erroneous supposition that the rainfall was sufficient for the cultivation of crops, moved away. The people of the State of Kansas realizing that the lands which had been settled upon were so destitute of moisture and the rainfall so slight as to render them incapable of being cultivated, and that only by diversion and application of the waters of the Arkansas river could agriculture be pursued in western Kansas, induced legislation upon the subject and the Kansas legislature, at i-s session in 1886, for the purpose of authorizing and allowing the diversion and use of the waters of said river for the purpose of reclaiming said lands, passed an act concerning irrigation in which it was declared that "the right to the use of running water flowing in a river or stream in this State, for the purpose of irrigation, may be acquired by appropriation."

22. In reliance upon said act of the legislature certain canals were constructed in eastern Colorado and extended into Kansas and certain other canals were constructed lying wholly in the State of Kansas, in the counties of Hamilton, Kearney, Finney, Gray, Ford, Edwards, Pawnee and Barton, for the diversion of the surface and underflow waters of said river and the application thereof to riparian and non-riparian lands in the valley of said river, in the irrigation and cultivation thereof, most of said ditches being owned by residents and citizens of the State of Kansas, but some of them being owned jointly by residents and citizens of Colorado and residents and citizens of Kansas, and said residents and citizens of Kansas are persons whose alleged rights are claimed by the amended bill of complaint herein to have been impaired by the diversion of the waters of said river in Colorado by this defendant and others.

Among the canals so constructed was one known as "the Dodge City canal," covering the land in the county of Ford alleged in the bill of complaint to have been conveyed in 1889 to the State of Kansas by the Government of the United States to be used as a sol-

diers' home, and also covering other lands along said river for a distance of about thirty miles. Said land in Ford county alleged to belong to the State of Kansas was also covered by another canal known as "the Eureka canal," commencing at the town of Ingalls and extending thence eastward about ninety miles.

23. All of the ditches and canals above referred to, as these defendants are informed and believe, have diverted and carried water for the irrigation of the lands lying thereunder when obtainable, and the owners of said lands have used the waters so diverted in the irrigation and cultivation thereof, and have at all times disclaimed and renounced any and all rights they might have to the continuous flow of the surface or underflow of waters of the said Arkansas river in contravention of the right to divert and apply the same to riparian and non-riparian lands in said valley, and the respective owners of said ditches and canals and of the riparian and non-riparian lands thereunder are, as these defendants respectfully suggest, necessary parties to any determination of the right of these defendants to divert and use the waters of said river as they and their grantors have been accustomed to do for many years last past.

24. The construction of the canals now owned and operated by these defendants and of other canals in Colorado and of the said canals in Kansas, and the reclamation and cultivation thereby of the arid and semi-arid lands in the State of Colorado and Kansas were well known to the owners of riparian and non-riparian land throughout the entire valley of the Arkansas in Kansas; detailed accounts of the same were published in all the papers issued in the various towns in said valley and from time to time excursions were taken by many of the people of said valley to inspect and report upon the irrigation system in vogue in Colorado and in particular the ditches in and about Rocky Ford where the canals belonging to these defendants are located and the owners of non-irrigable lands in said valley were constantly moving to and settling upon lands under said canals and ditches in Colorado and Kansas.

25. Since the year 1886, at intervals to the present time, conventions of the owners of riparian and non-riparian lands in said valley and the citizens thereof have been called and held at towns and cities in said valley in Kansas and Colorado to consider and devise methods for extending the system of irrigation used by said canals in Kansas and in Colorado and full reports of the progress of irrigation in the valley of the Arkansas river in Colorado have at all times been made to said conventions and of the taking of said water from the said river in the State of Colorado and the taking of said water by said canals in Colorado has been at all times acquiesced in, approved and the right to do so confirmed.

26. On February 14, 1889, the Senate of the United States adopted a resolution that a special committee of seven Senators be appointed by the President of the Senate, to be known as "the special committee on the irrigation and reclamation of arid lands," whose duty it should be to consider the subject of irrigation and to investigate and

report upon the best mode of the reclaiming public lands of the United States. Said committee was duly appointed and afterwards held sessions at various points in the valley of the Arkansas river in Kansas, at which sessions it was represented to said committee by the owners of lands along said river that the greater portion of said valley was incapable of being cultivated except by irrigation. That the lands had been taken up by settlers during a cycle of sufficient rainfall to admit of their cultivation and the Government of the United States had received the price of said lands in the belief, on the part of the settlers, that the same was susceptible of cultivation; that it had been found that the rainfall was insufficient to grow crops and that many of those claiming title from the Government had been compelled to leave the country and that the remainder were too poor to construct the irrigation works necessary to cultivate said lands. Constant reference was made to the ditches and canals which had been constructed in the State of Colorado and the beneficial effect secured by the irrigation of lands in said State. No objection or protest was made to the diversion of waters in Colorado nor was any claim made that the waters of said river should continue to flow from the State of Colorado into the State of Kansas as it had formerly done, but, on the contrary, it was urged that the Government should build, or aid in building, reservoirs in the mountains in Colorado in which to impound and store the waters of said river, that the same might thereafter be carried down said river for use in the irrigation of lands in Colorado and Kansas.

27. That since the year 1891 conventions of irrigators and owners of land in the arid West have been held at Salt Lake City, Los Angeles, Denver and other cities. Delegates to said conventions have been sent by the governor of Kansas and most of said delegates were selected from the valley of the Arkansas river and appeared in said conventions as special representatives of the owners of lands in said valley. At the convention held in Salt Lake City in September, 1891, delegates from the State of Kansas were instrumental in securing the adoption of resolutions memorializing Congress and the Representatives of the States and Territories of the arid West to secure appropriations for the construction of ditches and reservoirs for the reclamation of the arid and semi-arid lands in Kansas and other Western States and Territories by means of irrigation. At said conventions said delegates from Kansas made particular mention of the irrigation works constructed near Rocky Ford and elsewhere along the Arkansas river in Colorado and the same were pointed out in demonstration of what might be accomplished by irrigation, and it was urged that like systems should, by Government aid, be constructed in the valley of the Arkansas in Kansas. And it was further urged that the Government should make an irrigation survey of the lands in Kansas to aid those desiring to construct irrigation ditches or canals therein. Like demands were urged by delegates from the State of Kansas in other irrigation congresses with the result that the Government of the United States was in-

dnced to and did make an irrigation or contour survey of the lands in the valley of the Arkansas for the purpose of aiding in the extension of the irrigable area thereof.

28. On March 10, 1891, the legislature of the State of Kansas passed an act by which it was provided that in that portion of Kansas west of the 99th meridian, all natural waters whether surface or subterranean, shall be devoted first to purposes of irrigation in the aid of agriculture, subject to ordinary domestic uses, and secondly to other industrial purposes, and for such purposes they may be diverted from their natural channels. And it was provided by said act that the methods in force in the State of Colorado with reference to the use and sale of waters be adopted; and thereafter, by an act of the legislature, said statute was made applicable to all that portion of Kansas west of the 98th meridian. On March 5, 1895, by another act of said legislature, the board of irrigation survey and experiment was created, which was required to conduct experiments in irrigation in the State of Kansas. Thereafter, by another act of said legislature, the office of commissioner of forestry and irrigation was created and an appropriation was made for the maintenance of an experimental station at which the value of irrigation and the best methods thereof should be investigated, and thereafter the supreme court of the State of Kansas decided, on the 6th day of July, 1901, that the legislature of Kansas had, by the acts above referred to, recognized the principle of irrigation in said State and made the promotion of irrigation west of the 98th meridian a public use.

29. These defendants respectfully submit that the State of Kansas is not, as the owner or representative of the owners of lands in said Arkansas valley in Kansas, entitled to the relief sought in the plaintiff's amended bill of complaint against these defendants, because of the acts, doings and conduct of the State of Kansas and the owners of lands in said valley as above set forth, and by the delay of said State in filing said bill, and by the failure of the owners of land in said valley to assert the rights claimed in their behalf by said State, these defendants and the owners of lands under their canals have been induced to make large investments in reliance thereon, and said State of Kansas is in equity and good conscience estopped from now claiming any relief which would impair or destroy said investments.

30. These defendants respectfully submit that aside from the laws, usages and customs concerning irrigation prevailing in the States of Colorado and Kansas the said lands under the canals belonging to these defendants were and are riparian to said river and entitled by the principles and doctrines of the common law claimed by the bill of complaint herein to be applicable in both Colorado and Kansas, to divert the waters of said Arkansas river and to use the same in irrigation thereof, and that the use of said water on said lands for all purposes necessary to making the same habitable and capable of sustaining human life is a reasonable use authorized and protected

by the said principles and doctrines of the common law relied upon by the complaint.

III.

These defendants, for further joint and several answer and defense to the amended bill of complaint, say:

1. This defendant, The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, is the owner of a certain irrigating canal situate in Pueblo and Otero counties, in the State of Colorado, known as "the Rocky Ford Highline canal." Said defendant and its predecessor in title have appropriated water from the Arkansas river to the amount of sixteen cubic feet per second of date July 1, 1869, thirty cubic feet per second of date June 1, 1885, and two cubic feet per second of date March 11, 1886, and used the same continuously since the said date for the irrigation of lands and said appropriation now belongs to the said Rocky Ford Highline canal; that said defendant has appropriated water from the Arkansas river to the amount of four hundred and twenty-two and one-half cubic feet per second of date January 6, 1890, and used the same continuously since that date for the irrigation of lands and said appropriation now belongs to the said The Rocky Ford Highline canal.

2. This defendant, The Catlin Consolidated Canal Company, is the owner of a certain irrigating canal situated in Otero county, in the State of Colorado, known as the "Catlin ditch." Said defendant and its predecessors in title have appropriated water from the Arkansas river to the amount of two hundred and forty-eight cubic feet per second, of date December 3, 1884, and ninety-four cubic feet per second of date December 14, 1887, and have used the same continuously since said dates for the irrigation of lands, and said appropriations now belong to the said Catlin ditch.

3. This defendant, The Oxford Farmers' Ditch Company, is the owner of a certain irrigating canal, situated in the counties of Pueblo and Otero in the State of Colorado, known as the Oxford Farmers' ditch. Said defendant and its predecessors in title have appropriated water from the Arkansas river to the amount of twenty-eight cubic feet per second of date March 1, 1867, and one hundred and sixteen cubic feet of date February 26, 1887, and used the same continuously since said dates for the irrigation of lands, and said appropriations now belong to the said Oxford Farmers' ditch.

4. This defendant, The Laguna Canal Company, is the owner of a certain irrigating canal, situated in Otero county, Colorado, known as the "Lake canal." Said defendant and its predecessors in title have made appropriations of water from the Arkansas river by means of said canal to the amount of five hundred — fiteen cubic feet per second, of date September 25, 1889, and used the same continuously since the same was appropriated for the irrigation of lands, and said appropriations now belong to the said Lake canal.

5. After the location of said Lake canal, the owner thereof, for the purpose of availing himself of the provisions of the act of Congress

of March 3, 1891, granting rights of way for irrigation canals and reservoirs, filed with the register of the United Sates land office for the district where said canal and reservoir were located, a map of said canal and reservoir, which map was, on the 29th day of April, 1892, approved by the Secretary of the Interior, and thereafter the lands over and across which said canal extended were, when conveyed by the Government, conveyed subject to said right of way.

6. During the year 1890 the Government of the United States caused certain surveys to be made in the valley of the Arkansas river in the State of Colorado, for the purpose of investigating and selecting reservoir sites and running counter lines for the purpose of aiding and assisting those desiring to appropriate the waters of said stream and its tributaries for irrigation purposes and the Government of the United States in making such investigation and in selecting reservoir sites surveyed and located a reservoir site in township twenty-three (23), south of range fifty-five (55), west of the sixth principal meridian in Otero county, Colorado, on the line of said Lake canal, and caused to be filed in the office of the Secretary of the Interior a report of said investigation, and surveys and maps of said reservoir site, and caused the land included in said reservoir site to be segregated and withdrawn from entry and filing except as a reservoir site.

7. During the year 1894 this defendant, The Laguna Canal Company, developed and constructed the reservoir, the site of which had been previously filed on, said reservoir being called "Reservoir number one." Said reservoir is fed from the Arkansas river by means of the Lake canal and is capable of holding when filled 185,011,890 cubic feet of water. Two thousand acres of land are irrigated from said reservoir by means of an outlet canal built and owned by this defendant, which said outlet canal is fourteen miles long.

8. By means of the construction of said canals and said reservoir many thousand acres of land in the valley of the Arkansas river in the State of Colorado, which prior to said construction was waste and vacant land and fit only for grazing purposes, has been reclaimed, cultivated and made fruitful and productive. Many thousands of people have located thereon and built their homes. Cities and towns have sprung up and property values to the extent of many millions of dollars have been created.

9. Prior to the construction of said canals but a small portion of the lands lying in the territory thereunder had been filed on or subjected to private ownership. With the construction of said canals settlers from the arid parts of Colorado and Kansas began filing on said Government lands and began to locate homes thereon. More than four thousand three hundred acres of land lying in said territory were located and filed on by settlers and were finally patented by the Government of the United States under an act of Congress approved March 3, 1877, known as "the desert land act." Said

lands were patented on the strength of their having been reclaimed by means of the construction of said canals and the application by means of said canals of the waters of said river to the irrigation of said lands and in each instance proof was required by the Government of the United States of such reclamation and irrigation before issuing patents to said lands. More than fifty thousand acres of said lands were located and filed on by said settlers under an act of Congress of May 20, 1862, known as "the homestead law," an act of Congress of April 24, 1820, and acts supplemental thereto known as "the pre-emption law," an act of Congress of March 3, 1873, and subsequent acts, known as "the timber culture act," and were finally patented by the Government of the United States. The settlers availing themselves of the provisions of the pre-emption and homestead purchase acts were required to make settlement on lands in person and to inhabit and improve the same. At the time settlement was made on said lands Congress and the executive departments having in charge the administration of such acts well knew and at all times since said settlements were made they have well known that the provisions of said acts with respect to inhabitancy, settlement and improvement could not be complied with except by the diversion of the waters of the Arkansas river and its tributaries upon said lands and the application thereof to irrigation and domestic purposes.

10. The said canals were constructed and used by these defendants and their predecessors in title for the diversion of the waters of said river in reliance upon the acquiescence of the United States in the appropriation of such waters for irrigation purposes and upon the acts of Congress with reference to reclaiming arid lands and acquiring title thereto from the Government, in reliance upon long standing local customs, laws and decisions of the States of Kansas and Colorado by virtue of which customs, laws and decisions the appropriator of water from natural streams first in time is considered first in right and in reliance upon the recognition by the State of Colorado of the right to appropriate the waters of said State including the waters of the Arkansas river for irrigation purposes.

11. Prior to parting with the title to any of the land between the Mississippi river and the Pacific coast the General Government caused said lands to be explored and reported upon for the purpose of ascertaining the natural resources and the physical and climatic characteristics thereof, whereby it became known to the Unied States and the inhabitants thereof that from about the 98th meridian to the coast range of the Pacific slope the land was an arid waste without timber or useful vegetation, except in the mountains, and that although the soil was rich and fertile, the same could not be made productive nor inhabitable except by the diversion of waters in the natural streams and the application thereof to agricultural purposes, and that, in that portion of said domain which lay south of the Arkansas river the laws, customs and usages prevailing, authorized and sanctioned the diversion and use of the water for agricultural and

other useful purposes in contravention of the rights of the riparian owners to have such water continually flowing in its natural channel. With knowledge and recognition of such right and custom of the inhabitants of said arid region to divert waters and apply the same to beneficial and necessary uses the United States, in its treaty with Spain of February 22, 1819, and afterwards, in its treaty of January 12, 1828, with the United Mexican States, expressly stipulated and provided, that the use of the waters of the Arkansas river, and of certain other boundary streams, should be common to the respective inhabitants of both nations, parties to such treaties respectively.

12. Upon and after the creation and admission of the several Territories and States of said arid region, including Kansas, both as a Territory and State, they recognized, approved and confirmed and from thence hitherto have enforced said doctrine, and rights to water by diversion from the streams of said arid region have been maintained as against all claims of riparian rights in conflict therewith.

13. The Government of the United States, long prior to the sale by it of any of the public lands in the Arkansas valley, recognized and approved said doctrine, and applied the same to said public lands, and renounced and surrendered all riparian rights which it might have asserted in contravention of said doctrine, and from thence hitherto has held and disposed of said lands subject to and in accordance with said doctrine, and has at all times encouraged and promoted the diversion and use of the water of the streams in said arid region for agricultural and mining purposes, and, by grants of public money, has aided in the construction of canals, ditches and reservoirs and other appliances for the diversion, storage and use of water, in the reclamation and cultivation of the public lands.

14. By means of the diversion and use of the water of said natural streams, many millions of acres of the public lands in said arid region have been settled upon, inhabited and improved and title thereto obtained from the General Government, in the belief that by its action and conduct in the disposition of its public lands, the United States had accepted and applied to said public lands the doctrine of appropriation as hereinbefore set forth; and there has been paid to said General Government, on account of said lands so improved by the diversion and use of water in accordance with said doctrine, upwards of twenty millions of dollars, and the greater part of the lands in the valley of the Arkansas in the State of Colorado were settled upon and patents therefor obtained by proof of the diversion and use of the waters of said Arkansas river in the reclamation and improvement of said lands, said diversions so made being those complained of and sought to be enjoined in and by the bill of complaint herein.

15. By the act of Congress approved January 29, 1861, admitting Kansas into the Union, it was specifically provided that the State should never interfere with the primary disposal of the soil within the same by the United States, or with any regulations Congress might find necessary for securing the title in said soil to *bona fide*

purchasers thereof and that all laws of the United States not locally inapplicable should have the same force and effect within said State as in other States in the Union.

Following the admission into the Union of the State of Kansas, said doctrine of appropriation was further recognized by Congress as the law applicable to public lands and the natural streams thereof, including those in the State of Kansas, by the following acts:

An act approved June 26, 1866, by which it was provided that whenever, by priority of possession, rights to the use of water for mining, manufacturing or other purposes, have accrued and are recognized according to local customs, laws and decisions, the owners and possessors shall be maintained and protected in their rights;

An act approved July 9, 1870, in which it was provided that all patents granted, or pre-emptions or homesteads allowed, should be subject to any vested or acquired water right or rights to ditches or reservoirs used in connection with such water rights;

An act approved March 3, 1877, known as "the desert land act" (which by an act approved March 2, 1891, was made applicable to lands in Colorado), declared that all waters of all lakes, rivers and other sources of supply upon the public lands should remain and be held free for the appropriation and use of the public for irrigation, mining and manufacturing purposes, and in and by which it is also provided that by the construction of canals and ditches and the application of said waters to the irrigation of the public lands, the title to said land might thereby be obtained from the United States.

An act approved March 3, 1891, confirming the rights of way over the public lands in the arid regions for canals and reservoirs for irrigation purposes;

An act approved August 18, 1894, providing for the conveyance to the several States in the arid region of such public lands as they might reclaim and irrigate;

An act approved June 17, 1902, authorizing and undertaking the construction of canals, ditches and reservoirs in the arid region, including therein the State of Colorado and the western portion of Kansas, whereby the waters of the public lands might be diverted and used for irrigation purposes, and appropriating for that purpose the proceeds of all moneys received from the sale of public lands in the States of Colorado and Kansas.

16. The Congress of the United States in recognition of the doctrine of appropriation for irrigation purposes of waters of the natural streams in the arid region of the United States, on October 2, 1888, appropriated $229,000 for the purpose of investigating the extent to which said reason might be redeemed by irrigation, for the segregation of said irrigable lands in said arid region and for the selection of sites for reservoirs and other hydraulic works necessary for the storage and utilization of waters for irrigation; and on March 2, 1889, Congress made a further appropriation of $450,000 for like

purposes, all of which money was expended in investigating and selecting reservoir sites and running contour lines for the purpose of aiding and assisting those desiring to appropriate the waters of said streams for irrigation purposes. And the Government of the United States in making such investigation and in selecting reservoir sites surveyed and located a reservoir site on the Apishapa river, which is a tributary of the Arkansas river, in township twenty-eight (28), south of range sixty-one (61), west of the sixth principal meridian, in Las Animas county, Colorado, and caused to be filed in the office of the Secretary of the Interior a report of said investigation and surveys and maps of said reservoir site and caused the lands included in said reservoir site to be segregated and withdrawn from entry or filing except as a reservoir site. This defendant, The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, on the 2nd day of February, 1898, in reliance upon said reservoir site having been so segregated made its filing thereon in accordance with and under the provisions of sections 18 and 21 inclusive of the act of Congress approved March 3, 1891, entitled "An act to repeal the timber culture laws and for other purposes." The object sought by said defendant in filing on said reservoir site was to develope the same and construct a reservoir for the storage of flood waters to supplement the supply of its said canal and said defendant has expended in surveying said site and filing on the same and in preliminary work in the construction of said reservoir the sum of $1,500.

17. All grants and patents of land in the valley of the Arkansas, in the State of Kansas, were made by the United States, subject to the doctrine of appropriation heretofore set forth, and were accepted by the several grantees thereof with the knowledge that in the sale and disposition of the arid lands of the United States along said Arkansas river west of the 97th meridian, it had been and would be necessary to divert and use the waters of said river in the improvement and cultivation thereof, and said grants and patents of lands in the State of Kansas were made subject to the right of all persons desiring the use of the same for agricultural purposes to appropriate the waters of the Arkansas river, either in Kansas or Colorado, to the full extent of said river, and all patents granted and preemptions and homesteads allowed of lands in the valley of the Arkansas in the State of Kansas subsequent to July 9th, 1870, including in particular the lands described in the bill of complaint situated in Ford county, conveyed to said State of Kansas by the United States on the 13th day of June, 1899, and the lands in Reno county described in said bill of complaint conveyed to said State of Kansas at divers times subsequent to said 9th day of July, 1870, were, by the act of Congress of July 9th, 1870, made subject to all water rights in said river and rights of ditches and reservoirs in connection therewith acquired in accordance with the local customs, laws and decisions of Colorado.

18. The Territory of Kansas by its legislature, recognized and approved the said doctrine of appropriation, and in pursuance thereof

in 1859 authorized the St. Charles Town Company to divert the waters of the South Platte river and Cherry creek, and the Mountain Company to divert the waters of the Platte river, and the El Paso Town Company to divert the waters of the tributaries of the Arkansas river heading at Pike's peak; and in 1860 authorized the Capital Hydraulic Company to divert for irrigation purposes all the waters of the South Platte river and Cherry creek. And the State of Kansas, by its legislature, has also recognized, approved and adopted said doctrine; an act of said legislature enacted in 1868, authorizing corporations to construct canals diverting water for irrigation purposes; an act of the legislature enacted in 1886, providing that the running waters of the State might be appropriated for purposes of irrigation; an act of said legislature enacted in 1891, providing that in all that portion of the State west of the 99th meridian all natural waters, whether standing or running and whether surface or subterranean, should be devoted first, to purposes of irrigation in aid of agriculture, subject to ordinary domestic uses; and, second, to other industrial purposes, and might be diverted from natural beds, basins or channels for such purposes and uses; and another act, enacted in 1895, providing for the development of the lands west of the 98th meridian by irrigation and regulating the distribution of water in the same manner as in Colorado. Said State by said several acts renouncing and surrendering all rights it may have had in said river or the lands adjacent thereto as riparian owner in contravention of the right to divert the waters thereof for irrigation in Kansas or Colorado. And in reliance upon the approval and adoption of said doctrine of appropriation by said State of Kansas, about five hundred miles of canals and ditches have been constructed in Kansas, west of the 97th meridian at a cost approximating two million dollars and thereby the waters of said Arkansas river have been appropriated and applied to about one hundred and fifty thousand acres of land in the valley of said river, in the State of Kansas.

19. The inhabitants of the State of Kansas residing in the valley of the Arkansas river have at all times since the year 1882 or thereabouts encouraged the construction of ditches and reservoirs along said river and its tributaries for the purpose of irrigation and have by their own acts been instrumental in inducing the Government of the United States to make surveys of lands along said river and its tributaries in Colorado and Kansas to aid those desiring to construct ditches or canals, and the supreme court of the State of Kansas on the 1st day of July, 1901, decided and adjudged that the legislature of Kansas had by the acts above mentioned recognized the principle of irrigation in the State of Kansas and made the promotion of irrigation west of the 98th meridian a public use.

20. The provisions of the constitution of the State of Colorado set forth and complained of in the bill of complaint, were adopted in harmony with and in pursuance of the policy of the United States in respect to the diversion and use of water in the irrigation of lands, and the same do not conflict with or contravene any act of Congress

bearing upon said appropriation and use, but, on the contrary, are intended as a constitutional guaranty that the right to divert water for beneficial purposes as authorized and encouraged by the acts of Congress referred to shall never be denied, and said provisions were accepted and approved by the action of Congress in admitting Colorado into the Union, and the several acts of the legislature of Colorado, referred to in said bill of complaint, have been enacted for the purpose of protecting and regulating appropriations made in pursuance of the usages and customs prevailing in the arid region and the right of appropriation as recognized and confirmed by the acts of Congress referred to.

21. The State of Colorado has always recognized, and now recognizes, the common law right of riparian proprietors along the said Arkansas river in Colorado to make a reasonable use of the water thereof for irrigation purposes, said right being recognized by said State as a natural want and necessity for people living in a hot and arid climate such as exists along said river from the foothills of the mountains, where it has its source, to the eastern border of the State.

IV.

These defendants, for further joint and several answer and defense to the amended bill of complaint, say:

1. These defendants and their predecessors in title have appropriated waters from the Arkansas river for the purpose of irrigation, and have applied said waters to such purpose on the lands lying under their several irrigating canals in the valley of the Arkansas river in the State of Colorado, said appropriations having been used continuously since they were originally made. The amounts of said appropriations, the dates when they were originally made and the names of the canals to which they belong, are as follows:

The Oxford Farmers' ditch, owned by the defendant, The Oxford Farmers' Ditch Company, twenty-eight cubic feet per second, of date March 1, 1867.

The Rocky Ford Highline canal, owned by the defendant, The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, sixteen cubic feet per second, of date July 1, 1869.

The Catlin ditch, owned by the defendant, The Catlin Consolidated Canal Company, two hundred and forty-eight cubic feet per second, of date December 3, 1884.

The Rocky Ford Highline canal, thirty cubic feet per second, of date June 1, 1885.

The Oxford Farmers' ditch, one hundred and sixteen cubic feet per second, of date February 26, 1887.

The Rocky Ford Highline canal, two cubic feet per second, of date March 11, 1886.

The Catlin ditch, ninety-seven cubic feet per second, of date November 14, 1887.

The Lake canal, owned by the defendant, The Laguna Canal

Company, five hundred and fifteen cubic feet per second, of date September 25, 1889.

The Rocky Ford Highline canal, four hundred twenty-two and one-half cubic feet per second, of date January 6, 1890.

2. The said canals were constructed and used in irrigating lands lying thereunder in accordance with and in reliance upon the local customs, laws and decisions of the courts of the State of Colorado respecting the right to appropriate and use water for agricultural and other purposes, in force at the time said appropriations were made. The right to appropriate the waters of said river by means of said canals for irrigating purposes to the extent to which said appropriations were made, as hereinbefore set out, was, in the year 1896, as to those appropriations made by the Rocky Ford Highline canal and the Oxford Farmers' ditch, in proceedings then pending in the district court of the county of Pueblo, in the State of Colorado, which said proceedings were had in accordance with the acts of the General Assembly, of the State of Colorado of 1879 and 1881 concerning the adjudication of rights to water for irrigating purposes, recognized and confirmed, and said right of appropriation adjudged to be vested as of the dates of the respective appropriations. The right to appropriate the waters of said river by means of the said Catlin ditch for irrigating purposes to the extent to which said appropriations were made as hereinbefore set forth, was in the year 1891, in a like proceeding then pending in the district court of Bent county in the State of Colorado, also recognized, and adjudged to be vested as of the dates of the appropriations made by means of said canal. The right to appropriate the waters of said river by means of the said Lake canal for irrigating purposes was also, in the year 1894, in like proceedings in the district court of Bent county in the State of Colorado, recognized and adjudged to be vested in said canal to the extent of one hundred fifty-five cubic feet of water per second, as of date September 25, 1889.

3. The lands belonging to the State of Kansas, and used as a soldiers' home, as alleged in the amended bill of complaint, which were acquired from the Government of the United States on the 13th day of June, 1889, were taken by the State of Kansas subject to all the appropriations of water from said river, made as hereinbefore set out, except said appropriation made by the Lake canal, and said appropriation of January 6, 1890, made by the Rocky Ford High Line canal. All other lands in the valley of the Arkansas, acquired from the Government of the United States since the dates of the respective appropriations of water hereinbefore set out, were conveyed and taken subject to said appropriations.

4. As to all the lands in the valley of the Arkansas in Kansas acquired since the appropriation of said waters through said canals as hereinbefore set forth, the State of Kansas is not entitled, as against the canals belonging to these defendants, to the relief demanded in the amended bill of complaint herein; and these defendants further r-spectfully submit that the owners of the lands in said

valley are necessary parties to the determination of the rights claimed by the bill of complaint herein, and that they should be made parties plaintiff hereto and be compelled to set forth the dates of the several conveyances to them by the Government of the United States, of the lands now owned by them in said valley.

V.

These defendants, for further joint and several answer and defense to the amended bill of complaint, say:

1. This defendant, The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, is the owner of a certain irrigating canal situate in Pueblo and Otero counties, in the State of Colorado, known as "the Rocky Ford Highline canal." Said defendant and its predecessor in title have appropriated water from the Arkansas river to the amount of sixteen cubic feet per second of date July 1, 1869, thirty cubic feet per second of date June 1, 1885, and two cubic feet per second of date March 11, 1886, and used the same continuously since the said dates for the irrigation of lands and said appropriation now belongs to the said Rocky Ford Highline canal.

2. This defendant, The Catlin Consolidated Canal Company, is the owner of a certain irrigating canal, situated in Otero county, in the State of Colorado, known as the "Catlin ditch." Said defendant and its predecessor in title have appropriated water from the Arkansas river to the amount of two hundred and forty-eight cubic feet per second of date December 3, 1884, and have used the same continuously since said date for the irrigation of lands, and said appropriation now belongs to the said Catlin ditch.

3. This defendant, The Oxford Farmers' Ditch Company, is the owner of a certain irrigating canal, situated in the counties of Pueblo and Otero, in the State of Colorado, known as the Oxford Farmers' ditch. Said defendant and its predecessor in title have appropriated water from the Arkansas river to the amount of twenty-eight cubic feet per second of date March 1, 1867, and used the same continuously since said date for the irrigation of lands, and said appropriation now belongs to the said Oxford Farmers' ditch.

4. The diversion and use of the waters of said river have continued each and every year since they were originally made and until the filing of the amended bill of complaint herein, adversely to and in denial of the right of each and every riparian owner along said river in Kansas, as well as each and every owner of land in said Arkansas valley in Kansas, to the usual and ordinary flow of said river in Kansas over or along any of said lands as it had been accustomed to flow prior to the diversion of said waters by these defendants, and in denial of any right of the riparian owners along said stream or of lands in the vicinity thereof to the flow of the water of said stream, except as the same might continue after the diversion, through and by means of the canals owned and operated by these defendants, of the waters of said river necessary to the irrigation of said lands lying thereunder.

5. The diversion of the waters of the Arkansas river in Colorado for irrigation purposes commenced many years prior to the construction of any of the canals owned by these defendants or their predecessors in title and the flow of water in said river has been diminished by said appropriations and each and every owner of land along said river in Kansas well knew that said canals, as well as all other canals along said river in the State of Colorado, were diverting and using said waters adversely to and in derogation of any and all rights which they might claim or possess as riparian owners with respect to the waters of said Arkansas river.

6. These defendants respectfully submit that by the statutes of the State of Kansas concerning the limitation of actions, the right of each and every owner of land along said Arkansas river in Kansas to the usual and ordinary flow of said river, as the same existed prior to the appropriation of said waters in the State of Colorado, and in particular prior to the appropriation and diversion through and by means of the canals of these defendants and their predecessors in title made on or prior to March 11, 1886, became and are lost by fifteen years' adverse use thereof and all right of action concerning said waters became barred after the expiration of fifteen years from the commencement of the assertion and exercise of said adverse right.

VI.

These defendants, for further joint and several answer and defense to the said amended bill of complaint, say:

1. The diversion of waters from the Arkansas river by these defendants through their said canals does not in any way result in injury to the State of Kansas or to the owners of land in said State along said river or in the valley thereof, nor does it by any substantial amount diminish the usual and ordinary flow of water in said river in western Kansas. Many of the appropriators and users of water from said canals are the owners of lands riparian to said river and own land bordering on said river, which land said canals were built to irrigate. None of the lands under said canals are outside of the valley of said river and all of the water applied to said lands for irrigation purposes after leaving said canals flows toward said river and a large part of the same finds its way back into said river.

2. The Arkansas river leaves the foothills of the Rocky mountains at an elevation of about six thousand feet above sea level, and thence flows eastward over an elevated plateau known as the "Great Plains" for several hundred miles, with a practically uniform descent to the east, passing into the State of Kansas at an elevation of 3,350 feet and into the Territory of Oklahoma at an elevation of 1,000 feet. Through Colorado and Kansas it has a broad, level bed of sand, seldom entirely covered with water, the ordinary flow running in thin sheets in tortuous and constantly changing channels in the river bed. From the mountains, for four hundred miles east-

ward, the watershed of said river is naturally barren, treeless and without any vegetation, except the short sparse grass common to the Great Plains. The annual precipitation of moisture is about fourteen inches, most of which falls in local and violent storms. In its uncultivated condition, the land rapidly sheds the rainfall, discharges it into the river and prevents the saturation of the soil and the formation of springs by which said river and the tributaries along its course might be fed. The tributary streams are usually dry, carrying and discharging water into the river only in case of storms. The sun is seldom obscured and commencing near the State line between Colorado and Kansas, and continuing eastward for at least two hundred miles, the winds are dry and constant, in the summer season becoming so heated as to burn and destroy the vegetation and to absorb such water as may be in the bed of said river. The waters supplied to said river for about four hundred miles of its course after leaving the mountains are irregular in discharge and constantly varying in quantity, and are not sufficient to cause a steady and permanent flow during any season of the year. The main supply of the river is from the snows and storms in the mountains. As the snow melts only during warm days, this supply is also irregular and uncertain and the volume of water in the river, therefore, changes daily and even hourly. Long before irrigation was practiced in Colorado, it was observed that as the waters from the mountains flowed eastward, the volume constantly diminished, and this diminution was the more marked as the river passed beyond the area of local storms caused by the mountains. During the summer season except when flooded by violent showers, the river, at a distance of from two hundred to four hundred miles from the mountains, would show no surface water other than occasional pools in the sand, and none of the water coming into said river in Colorado would flow to or across the lands in the central or humid portion of Kansas.

3. The usual and ordinary flow of said river into the State of Kansas, as it is claimed to have been prior to the diversion of water in Colorado by these defendants and others, has been materially diminished by the destruction of timber in the water shed of said river in the mountains, the removal of the protection, which said timber afforded, causing the snow to melt much earlier in the summer season than heretofore and to come down in floods, instead of a long sustained flow. The breaking up and tilling of the land lying on both sides of said river, which, in its natural condition, was hard and which rapidly drained the water falling thereon, and the raising of crops on said lands, both in Colorado and western Kansas, for a distance of about two hundred miles, has caused the rainfall on said lands to sink into the earth, instead of passing rapidly to the river, and as said lands so broken and tilled lie along the course of the river, they have also intercepted the surface runoff from the drainage area back of and above said lands.

4. By said artificial application of water and by the interception

of the rain falling and draining upon said lands, the same condition has been and is being produced that obtains where rainfall is abundant. The lands have become saturated, veins and channels of water are thereby created and as the water seeks a lower level, it exudes by springs or swampy lands into the gulches and waterways, making them perennial streams discharging a uniform flow of water into the river.

These defendants now having fully answered all the allegations in the plaintiff's amended bill of complaint, or so much thereof as these defendants are advised should be answered, ask to be hence dismissed with costs and charges in this behalf sustained.

THE ROCKY FORD CANAL, RESERVOIR, LAND, LOAN AND TRUST COMPANY,
By W. A. COLT, President.
THE CATLIN CONSOLIDATED CANAL COMPANY,
By J. N. BEATY, Sec't'y.
THE OXFORD FARMERS' DITCH COMPANY,
By T. J. BARNARD, President.
THE LAGUNA CANAL COMPANY,
By H. R. HOLBROOK, President.

FRED. A. SABIN,
Solicitor of The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, The Catlin Consolidated Canal Company, The Oxford Farmers' Ditch Company, The Laguna Canal Company.

[Endorsed:] Supreme Court U. S., October term, 1903. Term No. 7, original. The State of Kansas, complainant, vs. The State of Colorado *et al.* Answer of The Rocky Ford Canal, Reservoir, Land, Loan & Trust Co., The Catlin Consolidated Canal Co., The Oxford Farmers' Ditch Co. and The Laguna Canal Co. to amended bill. Filed Nov. 2, 1903.

And afterwards, to wit, on the 11th day of November, A. D. 1903, the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL. } No. 7, Original.

On motion of Mr. Frederic D. McKenney, in behalf of counsel, leave is hereby granted to file the answer of the Colorado Fuel and Iron Company to the amended bill of complaint herein.

November 11th, 1903.

And on the same day, to wit, on the 11th day of November, A. D. 1903, an answer was filed in the words and figures following, viz:

United States Supreme Court, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL., Defendants.
} Original Proceeding, No. 7.

Answer of the Colorado Fuel and Iron Company to Amended Bill.

David C. Beaman, solicitor for The Colorado Fuel and Iron Company.
Cass E. Herrington, Fred Herrington, E. Parmalee Prentice, of counsel.

United States Supreme Court, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL., Defendants.
} Original Proceeding, No. 7.

Answer of the Colorado Fuel & Iron Company to the Amended Bill of Complaint.

I. In Relation to the Averments of the Amended Bill.

1. This defendant, now and at all times hereafter, saving to itself all and all manner of benefit or advantage of exception or otherwise that can or may be had or taken to the many errors, uncertainties and imperfections in the said amended bill contained, for answer thereto, or to so much thereof as this defendant is advised it is material or necessary for it to answer, says:

1. That it admits that the rise, course, drainage area and general physical characteristics of the Arkansas river and of the valley thereof, except as hereinafter set forth, are as stated in said amended bill of complaint.

2. It denies that the said Arkansas river is in fact, or within the laws or departmental rules and regulations of the United States, a navigable stream, either within the State of Colorado or the State of Kansas.

3. It denies that any diminution of the flow of said river from the State of Colorado into the State of Kansas is wholly or mainly attributable to the diversion of the waters of said river in the State of Colorado; and denies that the normal flow of said river at the State line, in the absence of irrigation, for ten months, or for any considerable period during the year, is upward of 2,000 cubic feet per second, or any amount in excess of 500 cubic feet per second.

4. It admits that the ordinary and usual rainfall in the valley of said river west of the ninety-eighth meridian is inadequate for the growing and maturing of cultivated crops; and avers that in that portion of the State of Kansas, the inhabitants thereof have been, and are, appropriating the water from said river and using the same for the irrigation of lands and other purposes as has been practiced in the State of Colorado for more than forty years past.

5. It denies that from time immemorial, or at all, the waters of said river have flowed through underlying sand and gravel, extending in width under the entire valley of the Arkansas river, or any material portion thereof; and denies that any part of the course and flow of said river is beneath the surface of the bottom lands of the valley, or that the course or flow thereof is of any greater width than the channel of said river between its banks, or that there is any underflow of water co-extensive with the valley of said river passing from the State of Colorado into the State of Kansas, or through said State of Kansas; and denies that the alleged underground water of said river furnishes sufficient moisture to grow ordinary farming crops in the absence of rainfall, unless supplemented by water obtained and applied by a system of irrigation such as is in use in Colorado and in the western part of Kansas.

6. It denies that the flow of the river or the underground waters to any appreciable extent tends to cool or moisten the surrounding atmosphere, promote the growth of vegetation, enhance the value of lands or conduce directly or materially to the public health or the habitability of the valley; and avers that such results throughout the arid and semi-arid portions of Kansas can only be produced by the diversion of water from the river and the application of the same by a system of irrigation to the adjoining lands, and the cultivation thereof.

7. It denies that the value of the lands in the valley of the Arkansas in said State of Kansas is, in any degree, dependent upon the natural and normal flow of water in said river; and denies that the acts alleged to have been done by this defendant are wrongful; and denies that, by reason of said alleged acts, the value of lands in the valley of the Arkansas river in the State of Kansas has been diminished in any sum whatever, or that the revenue of the State of Kansas arising therefrom has been, or will be, in any wise injuriously affected.

8. It admits the acquisition by the State of Kansas of the lands mentioned in said bill of complaint and the conveyance of certain portions thereof to the grantees mentioned therein; and alleges that all of said lands so acquired by said State of Kansas, and held by its grantees, as well as all lands acquired by settlers by homestead, pre-emption or purchase, were at all times, and now are, subject to the rights of other proprietors of lands and industrial enterprises in the valley of the Arkansas higher up said stream, and in Colorado and Kansas, to appropriate the water of said river and use the same for irrigation, manufacturing and other purposes.

9. It denies that the Arkansas river is now, or at any time has been, a navigable river in the State of Kansas or Colorado, or treated as such, or that the title to the bed of said river in the State of Kansas ever passed to said State, or that said State now is, or ever has been, the owner thereof or entitled to the control thereof, or has ever attempted to control the same save and except by acts of its legislature, as hereinafter referred to.

10. It has no knowledge of the several conveyances or grants of land in the valley of said river in the State of Kansas, heretofore made by the United States, except as hereinafter set forth, and avers that all of the conveyances or grants referred to in said bill of complaint, including in particular the lands alleged to be owned by said State of Kansas, were made subject to all rights to water from said river theretofore and thereafter to be acquired, and were taken with full knowledge on the part of said State of Kansas, and by each and every grantee of said lands, that the water of said river had been, were being and would be, appropriated in the State of Colorado for beneficial uses, and that the lands in said valley in the State of Kansas west of the ninety-eighth meridian, and in the State of Colorado, could only be made available by like appropriation and use, and that the United States, as the primary owners of said lands, had assumed that they held the same subject to the appropriation of the water of said river for beneficial uses, and that all patents of land granted after July 9, 1870, should be subject to all vested and acquired water rights in or over said river.

11. It denies that the lands alleged in said bill to belong to the State of Kansas, and situated in the counties of Ford and Reno, depend for their value for farming purposes upon the flow of water in the bed of said river, or upon the underflow beneath said land, or that they are entitled to the full, free and natural flow of water in said river to or beneath said land; and denies that the rights of the State of Kansas, as the owner thereof, are prior or superior to the rights of this defendant, as hereinafter more particularly set forth.

12. It denies that the diversion of the water of the Arkansas river by this defendant, and the use thereof, in any degree whatever diminishes the ordinary and usual flow of water in said State of Kansas, but, on the contrary, avers that, as a result thereof, and of its reservoirs for the storage of the flood and storm waters thereof, as hereinafter more particularly set forth, the average flow of water into said State of Kansas, outside of flood and storm periods, is thereby increased instead of diminished.

13. It denies that it is carrying any of the water of said river through its ditches or canals, to lands not riparian to said river.

14. It denies that when the Territory of Kansas was created, or the State of Kansas admitted to the Union, the water of said Arkansas river was wholly unappropriated, or that the common law and the riparian rights claimed in said bill extended over said valley in the State of Kansas, or that the owners of lands along said river were entitled to the unimpeded flow of the water of said river;

but, on the contrary, avers that numerous appropriations of said water had been made for irrigation and other purposes long prior to the creation of said Territory and many more were made prior to the conveyance by the United States of any of the lands lying along or adjacent to said river, and that the necessity and right to divert the water of said river for beneficial uses had, long previous to the creation of said Territory, been asserted and exercised by persons in possession of said lands, and said necessity and right were thereafter recognized by the legislature of the Territory of Kansas, and all lands along said river acquired by the State of Kansas, or by individuals or corporations within the Territory or State of Kansas, were taken and held with full knowledge of the climatic conditions which made necessary the diversion and use of the water of said river west of the ninety-eighth meridian, and that appropriations had been, were being and would be, made west of the ninety-eighth meridian within the States of Kansas and Colorado, and that, to the extent of said appropriations, the flow of water of said river might, by the laws, usages and customs then prevailing, be lawfully impeded.

15. It denies that, by its taking of water from said river in the State of Colorado, through its canals and ditches, and the use thereof, as hereinafter stated, the State of Kansas, or any of its citizens, or the owners of land along said river in the State of Kansas, have been injured in any degree whatever, or that the fertility of the lands or the use thereof to the fullest extent to which the same are naturally capable of use, have been diminished or impaired, or that the crops, trees and vegetation growing along said river have perished, or will perish, or that the wells have become or will become dry, or that the salubrity or healthfulness of said valley or of the lands adjacent to said river have been or will be impaired.

II. The initiation and growth of the doctrine of appropriation of water for irrigation, manufacturing, and other purposes.

1. This defendant avers that, beginning with the earliest settlement in the arid region of the United States, which was long prior to the opening of the lands to pre-emption and purchase, by necessity, common consent and uniform usage, the doctrine obtained that the water of all natural streams flowing through said arid region was subject to diversion, appropriation and use for agricultural and other purposes; that the right to the water thus diverted could be acquired, both as against the United States as the owner of the public lands, and as against all grantees of the United States of lands lying along said streams, and that the right of the several appropriators from any given stream should be in the order of appropriation and use, the first in time being first in right, and said doctrine has at all times been, and now is, the settled usage and law of said arid region in respect to the natural streams thereof.

2. Upon the creation and admission of the several Territories and

States of said arid region, including Kansas, their people and governments recognized, approved and confirmed, and from that time until now have enforced said doctrine, and rights to water by diversion from the streams of said arid region have been maintained as against all riparian rights in conflict therewith.

3. The United States, long prior to the sale of any of the public lands in the Arkansas valley, recognized and approved said doctrine, and applied the same to said public lands, and renounced and surrendered all riparian rights which they might have asserted in contravention of said doctrine, and from thence hitherto the United States have held and disposed of said lands subject to and in accordance with said doctrine, and at all times encouraged and promoted the diversion and use of the water of the streams in said arid region for agricultural, manufacturing and mining purposes, and by grants of public money aided in the construction of canals, ditches and reservoirs and other appliances for the diversion, storage and use of water, in the conversion and cultivation of the arid public lands, and for other beneficial uses.

4. By means of the diversion and use of the water of said natural streams, many million acres of the public lands in said arid region have been settled upon, inhabited and improved and title thereto obtained from the United States, in the belief that, by such action and conduct in the disposition of public lands, the United States had accepted and applied to said public lands the doctrine of appropriation as hereinbefore set forth; and there has been paid to the United States, on account of said lands so improved by the diversion and use of water in accordance with said doctrine, more than $20,000,000, and the greater part of the lands in the valley of the Arkansas, in the State of Colorado, were settled upon and patents therefor obtained by proof of the diversion and use of the water of said Arkansas river in the reclamation and improvement of said lands, said diversions so made being those complained of and sought to be enjoined in and by the amended bill of complaint herein.

5. The Territory of Kansas, by its legislature, recognized and approved the doctrine of appropriation, and in pursuance thereof in 1859 authorized the St. Charles Town Company to divert the waters of the South Platte river and Cherry creek, and the Mountain Company to divert the waters of the Platte river, and the El Paso Town Company to divert the waters of the tributaries of the Arkansas heading at Pike's peak; and in 1860 authorized the Capital Hydraulic Company to divert all the waters of the South Platte river and Cherry creek. And the State of Kansas has also recognized, approved and adopted said doctrine by an act of its legislature in 1868, authorizing corporations to construct canals diverting water for irrigation purposes; an act of its legislature in 1886, providing that the running waters of the State might be appropriated for purposes of irrigation; an act of its legislature in 1891, providing that in all that portion of the State west of the ninety-ninth meridian all natural waters, whether standing or running, and whether surface or sub-

terra-ean, should be devoted, first, to purposes of irrigation in aid of agriculture, subject to ordinary domestic uses; and, second, to other industrial purposes, and might be diverted from natural beds, basins or channels for such pu'poses and uses; and another act in 1895 providing for the development of the land west of the ninety-eighth meridian by irrigation and regulating the distribution of water in the same manner as in Colorado. Said State of Kansas, by said several acts renouncing and surrendering all rights it may have had in said river or the lands adjacent thereto as riparian owner in contravention of the right to divert the waters thereof for beneficial uses in Kansas and Colorado.

6. By the act of Congress approved January 29, 1861, admitting Kansas into the Union, it was specifically provided that the State should never interfere with the primary disposal of the soil within the same by the United States, or with any regulations Congress might find necessary for securing the title in said soil to *bona fide* purchasers thereof, and that all laws of the United States not locally inapplicable should have the same force and effect within said State as in other States of the Union.

7. Following the admission into the Union of the State of Kansas, said doctrine of appropriation was further recognized by Congress as the law applicable to the public lands and the natural streams thereof, including those in the State of Kansas, by the following acts:

An act approved July 26, 1866, by which it was provided that whenever, by priority of possession, rights to the use of water for mining, manufacturing or other purposes, have accrued and are recognized according to local customs, laws and decisions, the owners and possessors shall be maintained and protected in their rights;

An act approved July 9, 1870, in which it was provided that all patents granted, or pre-emptions or homesteads allowed, should be subject to any vested and acquired water right or rights to ditches and reservoirs used in connection with such water rights;

An act approved March 3, 1877, known as "the desert land act," which declared that all waters of all lakes, rivers and other sources of supply upon the public land should remain and be held free for the appropriation and use of the public for irrigation, mining and manufacturing purposes, and in and by which it was also provided that by the construction of canals and ditches and the application of said waters to the irrigation of the public lands, the title to said lands might thereby be obtained from the United States;

An act approved March 3, 1891, confirming the rights of way over the public lands in the arid region for canals and reservoirs for irrigation purposes;

An act approved August 18, 1894, providing for the conveyance to the several States in the arid region of such public lands as they might reclaim and irrigate;

An act approved June 17, 1902, authorizing and undertaking the

construction of canals, ditches and reservoirs in the arid region, including therein the State of Colorado and the western portion of Kansas, whereby the waters of the public lands might be diverted and used for beneficial purposes, and appropriating for that purpose the proceeds of all moneys received from the sale of public lands in the States of Colorado and Kansas.

8. Under and by virtue of said act approved March 3, 1877, which was made applicable to lands in Colorado by an act approved March 3, 1891, several thousand acres of land in the Arkansas valley, in the State of Colorado, were irrigated and converted, and the diversions of water for said purposes are in part the diversions complained of in the said bill.

9. Said doctrine was further recognized by Congress by the appropriation, on October 2, 1888, of $229,000 for the purpose of investigating the extent to which the arid region of the United States might be redeemed by irrigation, and for the segregation of the irrigable lands in such arid region, and for the selection of sites for reservoirs and other hydraulic works necessary for the storage and utilization of water, and also by a further appropriation made on March 2, 1889, of $450,000 for the like purpose, all of which moneys were expended in investigating and selecting reservoir sites, and in running contour lines for the purpose of aiding and assisting those desiring to appropriate and use the waters of the natural streams.

10. The provisions of the constitution of the State of Colorado complained of were adopted in harmony with and in pursuance of the policy of the United States in respect to the diversion and use of water, and the same do not conflict with or contravene any act of Congress, but, on the contrary, are in harmony with such acts and are intended as a constitutional guaranty that the right to divert water for beneficial purposes as authorized and encouraged by the acts of Congress should never be denied, and said provisions were accepted and approved by the action of Congress in admitting Colorado into the Union, and the several acts of the legislature of Colorado, referred to in said bill have been enacted for the purpose of protecting and regulating appropriations made in pursuance of the usages and customs prevailing in the arid region and the rights of appropriation as recognized and confirmed by the acts of Congress.

11. All grants and patents of land in the valley of the Arkansas, in the State of Kansas, were made by the United States, subject to the doctrine of appropriation heretofore set forth, and were accepted by the several grantees thereof with the knowledge that in the sale and disposition of the arid lands of the United States along said Arkansas river west of the ninety-seventh meridian, it had been and would be necessary to divert and use the water of said river in the improvement and cultivation thereof and for other purposes, and said grants and patents of lands were made subject to the right of all persons desiring the use of the water for beneficial purposes to appropriate the water of the Arkansas river, either in Kansas or

Colorado, to the full extent of said river, and all patents granted and all pre-emptions and homesteads allowed of lands in the valley of the Arkansas in the State of Kansas subsequent to July 9, 1870, including in particular the lands described in the bill situated in Ford county, conveyed to said State of Kansas by the United States on the 13th day of June, 1889, and the lands in Reno county described in said bill and conveyed to the said State of Kansas at divers times subsequent to said 9th day of July, 1870, were, by the act of Congress of July 9, 1870, made subject to all water rights in said river, and rights of ditches and reservoirs in connection therewith acquired in accordance with the local customs, laws and decisions of Colorado.

12. The lands in Ford county alleged by the bill to have been obtained by said State of Kansas by purchase from the United States in the year 1889 and used as a soldiers' home, as well as all other lands in the valley of the Arkansas, in the State of Kansas, acquired from the United States since the admission of said State into the Union in 1861, were conveyed and taken subject to the appropriation and use of the waters of said Arkansas river by this defendant as hereinafter set forth.

13. This defendant respectfully submits that as to all lands in the valley of the Arkansas in Kansas acquired subsequent to the appropriation of water by this defendant as herein set forth, the State of Kansas is not entitled to the relief demanded; and that the owners of lands in said valley are necessary parties to a determination of the rights claimed by the bill herein, and that they should be made parties hereto and compelled to set forth the dates of the several conveyances to them by the United States of the lands now owned by them in said valley.

III. The recognition and application by the State of Kansas and its citizens of the doctrine of appropriation, the consequent defect of parties, and the want of good faith in not avoiding the consequences of acts done by its own citizens.

1. This defendant further avers that beginning as early as the year 1861 and ever since, a great many citizens and corporations in Colorado, as well as Kansas, have constructed and maintained numerous and expensive reservoirs and ditches for the irrigation of their lands in Colorado and Kansas, and for other purposes, and have taken water therefor from the Arkansas river and its tributaries, and appropriated the same for the purposes aforesaid, believing that they had a legal right so to do, and relying upon the laws of the United States and of the States of Colorado and Kansas, which recognize that priority of appropriation gives priority of right to the water so appropriated; and relying also upon, and in accordance with the custom which had grown up among the citizens of the United States and of said States in pursuance of such laws. That in consequence of the appropriation and use of such water, large

and populous towns and cities have grown up, and many large farms have been improved and made valuable both in Colorado and Kansas, and the continuance of these towns, cities and farms, and of the prosperity of the people of the arid regions of Colorado and Kansas, depend upon the continued appropriation and use of such waters as aforesaid. All of which, and the effect, if any, of such appropriation and use of said water, was during all said time well known to the State of Kansas and to the citizens it claims to especially represent in this suit.

2. That many persons and corporations who were for many years prior to the filing of the original and amended bill herein, ever since have been and now are residents and citizens of Kansas, have continuously during said time appropriated, conducted by ditches to, and used upon their arid lands in said State, not riparian or abutting upon, or situated near the bed of the Arkansas river, water for irrigating such lands and other purposes, doing so, and claiming the right to do so, under and by virtue of the laws of the United States and of the State of Kansas relating to the appropriation and use of water for beneficial purposes.

That said persons and corporations are interested adversely to the claim of plaintiff, as asserted in this suit, and will be injuriously affected by the result if plaintiff succeeds.

That the names of some of them, and a description of the lands they have and do so own and water are as follows:

The Frontier ditch (being a continuation of the Buffalo canal in Colorado), watering lands in sections 22, 23, 24 and 25, township 23 south of range 43 west; sections 20, 21, 28 and 30, township 23 south of range 42 west, said ditch and lands owned by Harry Crittenden, T. B. Martin, Frank Crittenden, William Snavely, John Tomilson, Charles Woodman, Fred Pomeroy, John Schranstrom, William Rich, David Hess and John Donahue.

The Alamo canal, owned by the Alamo Irrigating Company, watering lands in township 24 south of ranges 39, 40 and 41 west, owned by John E. Frost, J. V. Pratt, W. F. Reed, James Gates, W. J. Martindale, D. A. Monroe, L. C. Price and others.

The Occidental canal, watering lands in sections 9, 10 and 11 in township 24 south of range 41 west, owned by B. J. Woodley, L. Inge and L. T. Worden.

The Alameda canal, watering lands in sections 16, 17 and 18 in township 24 south of range 40 west, and section 12, township 24 south of range 41 west, owned by C. F. Roe, E. J. Barber, Ben A. Wood, M. J. Clark, A. L. Huffman, Henry Packer and W. J. Parnell.

The Dodge City canal and Eureka canal, watering the land alleged in the amended bill to belong to the State of Kansas and used by it as a soldiers' home.

The said Eureka canal, owned and operated by the Kansas Water Works and Irrigating Company, and watering not only the land belonging to said State as aforesaid, but also several thousand acres of

land in township 26 south of ranges 21, 22, 23, 24, 25, 26, 27, and 28 west, and township 27 south of ranges 21, 22, 23 and 24 west, said lands being owned by persons whose names are unknown to this defendant, the said canal being about ninety miles in length.

Also, at least twenty-five other canals and ditches of an aggregate length exceeding 200 miles, and watering many thousand acres of non-riparian lands in Kansas, and used for manufacturing and other purposes, this defendant not being sufficiently advised as to the names and ownership of the canals and ditches or lands to set the same out in detail.

3. That by an act of Congress, approved March 3, 1863, there was granted to the State of Kansas, for the purpose of aiding in the construction of a railroad from the city of Atchison, by way of Topeka, to the western line of the State in the direction of Fort Union and Santa Fe, New Mexico, every alternate section of land designated by odd numbers, for ten sections in width on each side of said road, and lying in the valley of the Arkansas river, to which the right of homestead, pre-emption or other rights had not attached and which had not been reserved to the United States.

On February 9, 1864, the legislature of Kansas approved an act accepting said grant of land, which comprised many thousand acres in said valley.

On December 19, 1882, the State of Kansas conveyed said lands by patent to the Atchison, Topeka and Santa Fe Railroad Company.

There was no grant of lands to said company in Colorado.

The land department of said company was under the direction of A. S. Johnson, as commissioner, and John E. Frost, as chief clerk.

About 1885 settlement along the line of the road in the Arkansas valley had reached the west line of Kansas, and the land department of said company considered the matter of stimulating and aiding settlements in Colorado. The land department of said company, together with one I. R. Holmes, then local land agent of the company at Garden City, Kansas, in the interest of said railroad company, investigated the situation in Colorado and caused to be located the town of Lamar, thirty miles from the State line in Colorado. At that time there were no irrigation ditches in that part of the Arkansas valley, except one or two small ones constructed by small farmers for private use. Capitalists were invited by said land department to come in, and the Oxford ditch, the Lamar and La Junta canal, the Holbrook canal, the Highline canal and various other extensive irrigation enterprises, with the assistance of the land department, were pushed to completion. During this time most of the land in Kansas belonging to the company still belonged to it, and it was well known to said company that in the construction and operation of such canals in Colorado, the water of the river would be appropriated as against any rights of the lands then owned as aforesaid by the company in Kansas.

These lands were all thereafter sold by said company to private citizens, and they now constitute nearly or quite one-half of the lands

which the plaintiff, by its amended bill, claims the right to protect as against the operations so as aforesaid inaugurated and completed with the assistance of said railroad company, and as to such lands and their claim to the water, and as to the plaintiff and the citizens now owning such lands, there is no equity in said amended bill.

4. That in September, 1891, a convention of irrigators and owners of lands in the arid and semi-arid regions west of the Missouri river was held at the city of Salt Lake, in the then Territory of Utah, said convention being known as the "first irrigation congress." Delegates to said convention were sent by the governor of Kansas (most of them being from the Arkansas valley), as the representatives of the owners of lands in said valley. Said delegates reported to the members of said convention the circumstances under which the lands in said valley had been taken up and the price paid therefor to the United States; that the United States had received for said lands an amount approximating $6,000,000; that the land had been found to be unfit for cultivation or habitation without irrigation, and the convention was urged by them to demand of the United States that they encourage, promote and assist in the construction of the necessary irrigation works, whereby to obtain water for the irrigation of the lands in said valley; that the platform adopted at said irrigation congress, known as the "Salt Lake platform," was prepared at the request of said delegation from Kansas, representing the views and wishes of all the owners of riparian and non-riparian lands in said valley of the Arkansas river in Kansas, said platform being in part as follows:

"Whereas, large areas of arid lands and semi-arid lands situated upon the Great Plains in the Dakotas, western Nebraska, Kansas and Oklahoma, were settled upon in good faith by homeseekers, under the supposition that they were obtaining agricultural lands;

"And, whereas, the settlers upon such lands have expended much time and labor upon the same and paid into the United States Treasury therefor many millions of dollars, only to discover that irrigation, to a greater or less extent, is necessary in making homes for themselves thereon; therefore, be it

"Resolved, That the representatives of all the States and Territories directly concerned in irrigation do hereby pledge their unwavering support to the just demands of such settlers that the General Government shall donate at least a portion of the funds received from the sale of such lands toward the procurement of the means necessary for their irrigation."

At said convention reference was made by said delegates from Kansas to the irrigation works constructed at Greeley, Rockyford and along the Arkansas river in Colorado, and the same was pointed out as a demonstration of what could be accomplished by irrigation, and it was urged that the like system should, by Government aid, be applied in the valley of the Arkansas in Colorado and Kansas, and it was further urged that the United States should make survey of the lands in Kansas to aid those desiring to construct ditches or

canals, and to furnish information to all persons wishing to know the lines which might be followed by canals and ditches in said valley.

At subsequent meetings of said irrigation congress, held at Los Angeles, Cal., in 1893, and in Denver, Colo., in 1894, delegates representing the owners of lands in and the citizens of said Arkansas valley in Kansas, were again present, urging the support of said convention in the application of the people of said valley to the United States for aid in the construction of irrigation works. In all of said conventions the demands of the delegates from Kansas were acceded to and the United States was induced to and did make an irrigation or contour survey of the lands in the valley of the Arkansas for the purpose of aiding in the scheme.

5. That if it be true, as alleged by the complainant, that the diversion and appropriation of the water of the Arkansas river for beneficial uses in Colorado causes or tends to cause the injuries to the State of Kansas and certain of its citizens, it is also true that other citizens and residents of western Kansas owning lands lying west of and above the lands described in the amended bill, have been for many years and still are appropriating such water for beneficial uses to and upon their lands, aforesaid, which are non-riparian, claiming the legal right to do so under the same and similar laws under which this defendant and other citizens of Colorado claim, and adversely to the alleged riparian rights set forth in said amended bill.

That the claims and appropriations of said citizens of western Kansas of said water are to such extent as to totally exhaust the ordinary flow of the Arkansas river before it would reach the lands belonging to the State of Kansas and the citizens it claims especially to represent, so that any decree which this court might or could render adverse to the defendants would be of no avail or benefit to said State of Kansas or the citizens it claims to represent, unless a the same time all the aforesaid citizens of western Kansas claiming and appropriating said water for beneficial uses, and especially those corporations and persons hereinbefore named as owners of lands and ditches in western Kansas, are also made parties hereto and likewise restrained from such uses, they being necessary parties defendant to this suit. That for the reasons above stated this court has no jurisdiction of the parties now defendant or of the subject-matter of this suit.

6. That the claims to and appropriation of such water for beneficial uses, adverse to the riparian rights alleged in said amended bill, by said citizens and residents of western Kansas, have been made and carried into effect for many years past, with the full knowledge of said State.

That, notwithstanding such fact and knowledge said State has never instituted any proceeding or sought in any way to prevent or restrain the same, but on the contrary has from time to time authorized, recognized and approved such acts, and the institution of this action is not in good faith by said State.

IV. The operations of this defendant and the injury that would result to the people of Colorado and Kansas if the bill is sustained.

1. This defendant, further answering, avers that it now is, and its predecessors in interest have been ever since 1877, engaged in mining coal and iron ore, and manufacturing coke, steel rails, and other steel and iron products, and this defendant has now in operation twenty-seven coal mines, four iron mines, six coal washeries, 3,020 coke ovens, and extensive steel works, the greater part of which are situated in the counties of Fremont, Pueblo, Huerfano and Las Animas Colorado, and upon the Arkansas river and its tributaries; and are wholly dependent for their operation upon water obtained by reservoirs and ditches, from the drainage area of said river.

That during the fiscal year ending June 30, 1903, the tonnage product of this defendant was as follows:

	Tons.
Coal	5,271,942
Coke	994,752
Steel and iron	968,884

the same having an aggregate value exceeding $17,000,000; the aggregate value of the coal and coke exceeding $9,000,000.

That its pay rolls to employés during said period exceeded $600,000 monthly, and for the year aggregated $8,990,000.

2. That, prior to the year 1877, and ever since, this defendant and its predecessors in interest, in order to provide water for the operations aforesaid, have been engaged in acquiring, by purchase from the owners thereof, water rights on and along the Arkansas river and its tributaries in Colorado, many of such rights having priorities under the laws of the United States and Colorado antedating the year 1860, and this defendant now owns such water rights to an aggregate amount of about 100 cubic feet per second.

3. That prior to the year 1877, and ever since, this defendant and its predecessors in interest have also been engaged in constructing reservoirs within such area for the purpose of collecting and conserving the flood and surface water of said area as well as the water so purchased as aforesaid, and to be thereafter purchased by them and it.

That prior to or about the year 1877 there was so constructed the defendant's reservoir No. 1, situated near the city of Pueblo in Pueblo county, Colorado, having a storage capacity of 500,000,000 gallons of water.

That in 1900 there was so constructed the defendant's reservoir No. 2, situated in said Pueblo county, having a storage capacity of 500,000,000 gallons of water.

That in 1902 there was so constructed the defendant's reservoir No. 3, situated in said Pueblo county, having a storage capacity of 2,700,000,000 gallons of water.

That ever since their construction said reservoirs have been annually filled or partially filled by and through the feeders thereof with the flood water and the other water so acquired from the San Carlos river, a tributary of the Arkansas, and with surface water falling or coming upon the lands of defendant and others adjacent to said reservoirs.

That the water so collected was continuously, during each year, taken into and used in its steel plant for the purposes incident thereto, without unnecessary use or waste, there being consumed or lost by such use less than fifty per cent. of that so taken in, more than fifty per cent. being returned to the stream.

That most of the water so collected in said reservoirs and used and returned as aforesaid, was flood and surface water, collected in early spring at a time when, if not so collected, conserved and returned, it would, as it formerly did, flow down the Arkansas river in such large volume during short periods that the principal portion of it would be and was of no value or benefit to the plaintiff or anyone it claims to represent, but many times a serious injury to them.

That by reason of such collection, conservation and return of water, and notwithstanding the partial consumption thereof by defendant as aforesaid, the flow of water in the Arkansas river in Kansas was during said time greater in the aggregate, more continuous and more equally distributed throughout each year than before, and the plaintiff and those it claims to represent were in no way injured thereby, but were, in fact, greatly benefited, as were many other citizens of Kansas who were then and still are dependent on the equal flow of water in said river for irrigating their lands in Kansas, and for other purposes.

4. That this defendant has just completed its Sugar Loaf reservoir, situated in Lake county, Colorado, having a storage capacity of 5,600,000,000 gallons of water, and has also partially completed its Purgatory reservoir, situated in Las Animas county, Colorado, to have a storage capacity of 650,000,000 gallons of water, in which reservoirs it also proposes to collect, for use in its steel plant and in its coal mines, washers, coke ovens, etc., and return, as aforesaid, the flood water of the upper Arkansas river and of the Purgatory river, a tributary of the Arkansas, and surface water aforesaid, and which will still further tend to augment and equalize the flow of water in said river in Kansas, and result in no injury, but to the great and further benefit of the plaintiff and those it claims to represent, as well as to many other citizens of Kansas who are dependent on the increased and equal flow of the water of said river.

5. That said Sugar Loaf reservoir was constructed by this defendant under and by virtue of an act of Congress, entitled "An act to vacate the Sugar Loaf Reservoir site in Colorado," etc., approved March 2, 1897, which act vacated the Government's rights therein, restored it to the public domain and authorized the Secretary of the Interior to sell the same at public auction under such regulations as

he might prescribe to secure the early building and permanent maintenance of a reservoir to increase the flow of the Arkansas river, and to supply water for mechanical, manufacturing and other purposes, subject to such control by the State of Colorado as is provided by its laws.

That in pursuance of said act this defendant acquired said site and on or about October 17, 1903, completed said reservoir at an expense exceeding $120,000, and is authorized and entitled to maintain and operate the same as contemplated in said act.

6. That the other reservoirs above referred to were and are to be constructed in accordance with the general laws of the United States and of the State of Colorado, in relation to the construction of reservoirs, and its water rights aforesaid have been adjudicated and confirmed by decrees of court in conformity with the laws of Colorado.

7. That in connection with the purchase of the ditches and water rights aforesaid the defendant also acquired and now owns the lands to which said ditches and water rights were appurtenant, to an amount exceeding 8,000 acres, all of which adjoin or abut upon the beds of the Arkansas, San Carlos and Purgatory rivers, and were then and are now entitled to all the rights accruing to them as riparian lands, which rights are now owned and entitled to be enjoyed by this defendant.

8. That the water which defendant has at any time taken or used, or now takes or uses, or is proposing to take and use, from the ordinary flow of said streams, does not equal that acquired in connection with the purchase of said lands, and which was appurtenant thereto, and in such use defendant has at no time done more than to exercise its riparian rights as a user of such water. But defendant does not by this plea waive or abandon any right it has under the Constitution and laws of the United States and the State of Colorado, on account of priority of appropriation for beneficial uses.

9. That in the purchase of said ditches, water rights and lands, and the construction of its ditches and reservoirs the defendant has expended about $500,000, and it has invested in its other lands and plants in the drainage area of the Arkansas river about $25,000,000, all of which depend for their operation on the water so collected, taken and used as aforesaid, and if deprived of such water or any considerable portion thereof the value of its investment and property would be effectually destroyed, and this defendant would be thereby irreparably injured, there being no other available water supply therefor.

10. The defendant and its predecessors have also purchased and constructed since 1877 about twenty miles of ditches, and defendant has now in course of construction about seventy miles of additional ditches within the area aforesaid, all of which are intended to be used in connection with its operations, but which will not tend to decrease the usual and ordinary flow of water in said Arkansas river into or through the State of Kansas.

11. That in its operations aforesaid the defendant employs about

18,000 persons, their families and dependents numbering about 80,000 persons additional, all of whom are at present wholly and directly dependent on such operations for support.

That in addition to the persons so directly employed or depending for support on said employés, the defendant's operations furnish to other auxiliary and dependent industries and to railroads a large amount of business, and thereby indirectly furnish to about 100,000 other persons a large proportion of their present employment and support.

That of the employés and other persons so directly and indirectly dependent on its operations more than fifty per cent. reside on and along the Arkansas river and its tributaries, and within the drainage area of said river.

12. That at its various mines and plants, situated in the drainage area of the Arkansas river, flourishing towns of greater or less size have grown up, which are wholly dependent for their present and future existence on the continuation of said operations at such points, said towns having an aggregate population of about 22,000 persons.

That the inhabitants of most of these towns are also wholly and directly dependent for their water for domestic purposes, fire protection, etc., on the water supply furnished to them by this defendant from its general water supply.

13. This defendant also has in course of construction extensive additions to its steel and other plants, which when completed will increase the number of its employés about 1,000, and the number of persons dependent on them for support in proportion.

14. That the resident population of the drainage area of the Arkansas river in Colorado exceeds 175,000.

That the assessed value of property in said area is as follows:

Farms and grazing lands	$10,000,000
Live stock	8,000,000
Miscellaneous	18,000,000
Total	$36,000,000

The actual value is about twice the above. Many of these residents are either directly or indirectly dependent on the operations of this defendant as aforesaid, while the balance of them are either farmers having large and extensive farms in a high state of cultivation, or stock growers, or engaged in other occupations, all depending, directly or indirectly, for their existence and prosperity upon the continuance of the right to appropriate and use the water of such area for agricultural, mining, manufacturing and domestic purposes.

15. That in the event that this defendant and the residents of the drainage area of the Arkansas river in Colorado should be deprived of their right to so use such water, almost the entire drainage area of said river would become a desert and of little value, as it was prior to its settlement and improvement aforesaid, resulting in irreparable

and incalculable injury and damage to the people so immediately concerned as well as to the State of Colorado.

16. That substantially all the fuel used in western Kansas by beet sugar factories, flour mills and other industries, and for domestic purposes, is coal mined in Colorado, and within the drainage area of the Arkansas river, and a very large proportion of it is mined by this defendant from lands owned by it, which comprise the principal available supply of coal within that area.

That in the winter time the demand and necessity for coal from Colorado, especially for domestic purposes, in the treeless region of Kansas, is very great, and it is often very difficult to supply it to a sufficient extent to prevent suffering.

That during the fiscal year aforesaid this defendant's shipments of coal into Kansas for consumption by its beet sugar factories, flour mill and other industries, and for domestic use, was as follows:

	Tons.
To points west of Hutchinson	150,000
To points east of Hutchinson	75,000
Total	225,000

the same having an aggregate value at points of delivery of $1,350,000.

That in producing steel, coal andcoke a considerable and constant supply of water is required for power, domestic and other purposes, and the continuance of such production within the drainage area aforesaid is wholly dependent on the use of water from such drainage area.

17. That this defendant also owns the principal available supply, and furnishes a large proportion of the coal and coke used by the smelters and other large industries of Colorado, Nebraska, Idaho, Wyoming, Montana, Utah and New Mexico, and to some extent that so used in other States adjacent thereto.

That in addition to the fuel supplies furnished to industrial plants and for domestic use in the States aforesaid, it furnishes a large amount of steel and fuel to the various railroad systems within said States.

18. That the cutting off of such fuel supplies furnished by this defendant, or any considerable portion thereof, would result in the shutting down of, or material injury to, most of such industries and cause distress among the inhabitants, to the great and irreparable injury of the citizens of all said States, as well as those of western Kansas.

19. This defendant avers that in its operations aforesaid it is a user rather than a consumer of water, returning to the streams a large percentage of the water originally taken out by it, and that at no time, nor in any manner, have its operations aforesaid injured the State of Kansas nor any citizen thereof, nor deprived them or

any of them of their rights, directly or indirectly, nor will they do so in the future.

V. Waiver, estoppel, laches, and the statutes of limitation.

1. This defendant further avers that it, its grantors and predecessors in interest, acquired the property, water and water rights, made all the improvements hereinbefore referred to in good faith, and relying on the laws, customs and usages of the United States, of the State of Colorado, and of the State of Kansas, in relation to the appropriation and use of water for agricultural, mining, manufacturing and domestic purposes, and on the waiver and surrender by said State of Kansas and all other owners of lands along said Arkansas river of all riparian rights inconsistent therewith, as hereinbefore more fully set forth.

2. That the State of Kansas and those whom it claims to represent had also full knowledge of the operations of this defendant and of the other appropriators of water in Colorado and Kansas hereinbefore set forth as the same occurred; and of the effect of the same, whatever it may have been, upon the flow of water in said Arkansas river, but made no objection to or protest against any of the operations hereinbefore referred to, but acquiesced therein and appropriated and enjoyed the benefits accruing to them therefrom and recognized that priority of appropriation of the water of the Arkansas river gave priority of right, regardless of riparian ownership, and the said State of Kansas, and the citizens it claims to represent, are guilty of laches, and have no right to maintain this suit as against this defendant.

3. That the State of Kansas is not, as the owner or the representative of the owners of lands in said Arkansas valley in Kansas, entitled to the relief sought in said amended bill of complaint against this defendant, because, by the acts, doings and conduct of said State of Kansas and of the owners of lands in said valley as hereinbefore set forth, and by the delay of said State in filing its said bill, and by the failure of the owners of lands in said valley to assert the rights claimed in their behalf by said State, this defendant, and the other appropriators aforesaid, have been induced to make their large investments in reliance thereon, and said State of Kansas, and the citizens it claims to represent are, in equity and good conscience, estopped from now claiming any relief which would impair or destroy the value of the same.

4. That the principal acts performed by defendant and its predecessors, and its and their original appropriation and use of water from the Arkansas river and its tributaries, of which plaintiff complains, occurred prior to the year 1895, and the right of action on the part of said State or those whom it claims to represent, if any such rights they have on account thereof, accrued more than six years prior to the filing of the amended bill, and this suit as to such

acts and appropriation is barred by the statute of limitations of the State of Colorado.

5. That the principal acts performed by defendant and its predecessors, and its and their original appropriation and use of water from the Arkansas river and its tributaries, of which plaintiff complains, occurred prior to the year 1888, and the right of action on the part of said State or those whom it claims to represent, if any such right they have on account thereof, accrued more than fifteen years prior to the filing of the amended bill, and this suit as to such acts and appropriation is barred by the statute of limitations of the State of Kansas.

6. The defendant further avers that by its long continued appropriation and use of said waters, as aforesaid, and the acquiescence and conduct of the State of Kansas and its citizens, it has acquired a prescriptive right thereto to the full extent of its appropriation and use thereof.

This defendant, now having fully answered all the allegations in the plaintiff's amended bill of complaint, or so much thereof as the defendant is advised should be answered, asks to be hence dismissed with costs and charges in this behalf sustained.

DAVID C. BEAMAN,
Solicitor for the Colorado Fuel and Iron Company.

CASS E. HERRINGTON,
FRED HERRINGTON,
E. PARMALEE PRENTICE,
Of Counsel.

[Endorsed:] Supreme Court U. S. October term, 1903. Term No. 7, original. The State of Kansas, complainant, vs. The State of Colorado *et al.* Answer of Colorado Fuel and Iron Company to amended bill. Filed Nov. 11, 1903.

And afterwards, to wit, on the 12th day of January, A. D. 1904 the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL. } No. 7, Original.

On motion of Mr. John F. Shafroth, in behalf of counsel for the defendants, leave is hereby granted to file a stipulation of counsel in relation to filing additional pleadings herein, and, in pursuance of said stipulation,

It is now here ordered by the court that the complainant herein be, and it is hereby, required to plead on or before the first Monday

of March next, to the answer of the State of Colorado filed herein on October 12th, 1903, and to each and every of the other answers filed by the other defendants.

January 12th, 1904.

And on the same day, to wit, on the 12th day of January, A. D. 1904, a stipulation was filed in the words and figures following, viz:

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
v.
THE STATE OF COLORADO, THE ARKANSAS Valley Sugar Beet and Irrigated Land Company, *et al.*, Defendants.
} Original Proceeding No. 7.

Stipulation.

It is hereby stipulated and agreed between C. C. Coleman, attorney-general of the State of Kansas, attorney of record in the above-entitled cause for plaintiff, and N. C. Miller, attorney-general of the State of Colorado, attorney of record for defendant in the above entitled cause, that an order may be entered in said cause requiring the plaintiff to plead on or before the first Monday in March, A. D. 1904, to the answer of the State of Colorado, filed on the 12th day of October, 1903, and to each and every of the other answers filed by other defendants in the above entitled cause, to said amended petition of plaintiff; and for the purpose of the execution of this stipulation and securing said order, the said N. C. Miller represents each and every one of the defendants in said cause:

Dated this 5th day of December, A. D. 1903.

C. C. COLEMAN,
Attorney General of Kansas.
N. C. MILLER,
Attorney General of Colorado.

Endorsed: In the Supreme Court of the United States. The State of Kansas, complainant, vs. The State of Colorado, defendants. Stipulation. N. C. Miller, attorney-general.

Endorsed: Supreme Court, U. S., October term, 1903. Term No. 7, original. The State of Kansas, complainant, vs. The State of Colorado. Stipulation for an order requiring complainant to plead to answers to cross-bill. Filed January 12", 1904.

And afterwards, to wit, on the 7th day of March, A. D. 1904, a motion was filed in the words and figures following, viz:

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO. } Original No. 7.

Now comes the State of Kansas, complainant in the above-entitled cause, by George A. King, Esq., appearing on behalf of C. C. Coleman, Esq., attorney general of said State of Kansas, and moves the court for leave to file replications to the answers of all the defendants who have answered the bill of complaint.

GEORGE A. KING,
Solicitor and of Counsel.

Endorsed: In the Supreme Court of the United States, October term, 1903. Original No. 7. The State of Kansas, complainant, vs. The State of Colorado. Motion for leave to file replications. George A. King, solicitor and of counsel for complainant.

Endorsed: Supreme Court, U. S., October term, 1903. Term No. 7, orig'l. The State of Kansas, complainant, vs. The State of Colorado. Motion for leave to file replications. Filed Mar. 7", 1904.

And on the same day, to wit, on the 7th day of March, A. D. 1904, the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL. } No. 7, Original.

On motion of Mr. George A. King, in behalf of counsel for the complainant, leave is hereby granted to file replications to the several answers of the defendants herein.

March 7th, 1904.

And on the same day, to wit, on the 7th day of March A. D. 1904, replications were filed in the words and figures following, viz:

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO and THE BESSEMER Ditch Company, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Conpany, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants.

No. 7, Original. Oct. Term, 1903.

Replication of the Complainant to the Separate Answer of the Defendant, The State of Colorado.

C. C. Coleman, attorney-general.
N. H. Loomis, F. Dumont Smith, S. S. Ashbaugh, attorneys for complainant.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO and THE BESSEMER DITCH COMPANY, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants. } No. —.

Replication of the Complainant to the Separate Answer of the Defendant, The State of Colorado.

Comes now the said The State of Kansas, complainant, saving and reserving to itself all and all manner of advantage and exception which may be had and taken to the manifold errors, uncertainties and insufficiencies of the answer of the defendant The State of Colorado to the amended bill of complaint, filed herein, for replication thereunto says that it does and will aver, maintain and prove its said amended bill of complaint to be true, certain and sufficient in the law to be answered unto by the said defendant, and that the answer of the said defendant is very uncertain, evasive and insufficient in the law to be replied unto by this complainant; without this, that any other matter or thing in the said answer contained material or effectual in the law to be replied unto and not herein and hereby well and sufficiently replied unto, confessed or avoided, traversed or denied, is true; all which matters and things this complainant is ready to aver, maintain and prove as this honorable court shall direct; and the said complainant humbly prays as in and by its said amended bill it has already prayed.

C. C. COLEMAN,
Attorney General.

N. H. LOOMIS,
F. DUMONT SMITH,
S. S. ASHBAUGH,
Attorneys for Complainant.

[Endorsed :] Supreme Court U. S. October term, 1903 Term No. 7, orig'l. The State of Kansas, complainant, vs. The State of Colorado *et al.* Replication of complainant to separate answer of defendant The State of Colorado. Filed March 7, 1904

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant, vs. THE STATE OF COLORADO and THE BESSEMER Ditch Company, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants.	No. 7, Original, Oct. Term, 1903.

Replication of the Complainant to the Separate Answer of the Defendant, The Graham Ditch Company.

C. C. Coleman, attorney-general.
N. H. Loomis, F. Dumont Smith, S. S. Ashbaugh, attorneys for complainant.

In the Supreme Court of the United States.

The STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO and THE BESSEMER DITCH Company, a Corporation: The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal Reservoir, Land, Loan and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants. } No. —.

Replication of the Complainant to the Separate Answer of the Defendant, The Graham Ditch Company.

Comes now the said The State of Kansas, complainant, saving and reserving to itself all and all manner of advantage and exception which may be had and taken to the manifold errors, uncertainties and insufficiencies of the answer of the defendant The Graham Ditch Company to the amended bill of complaint filed herein, for replication thereunto says that it does and will aver, maintain and prove its said amended bill of complaint to be true, certain and sufficient in the law to be answered unto by the said defendant, and that the answer of the said defendant is very uncertain, evasive and insufficient in the law to be replied unto by this complainant; without this, that any other matter or thing in the said answer contained material or effectual in the law to be replied unto and not herein and hereby well and sufficiently replied unto, confessed or avoided, traversed or denied, is true; all which matters and things this complainant is ready to aver, maintain and prove as this honorable court shall direct; and the said complainant humbly prays as in and by its said amended bill it has already prayed.

C. C. COLEMAN,
Attorney General.

N. H. LOOMIS,
F. DUMONT SMITH,
S. S. ASHBAUGH,
Attorneys for Complainant.

[Endorsed:] Supreme Court U. S. October term, 1903. Term No. 7, orig'l. The State of Kansas, complainant, vs. The State of Colorado *et al.* Replication of complainant to separate answer of defendant The Graham Ditch Co. Filed March 7, 1904.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO and THE BESSEMER Ditch Company, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants.

No. 7, Original, Oct. Term, 1903.

Replication of the Complainant to the Separate Answer of the Defendant The Arkansas Valley Sugar-beet and Irrigated Land Company.

C. C. Coleman, attorney-general.
N. H. Loomis, F. Dumont Smith, S. S. Ashbaugh, attorneys for complainant.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO and THE BESSEMER DITCH COMPANY, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan, and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants. } No. —.

Replication of the Complainant to the Separate Answer of the Defendant The Arkansas Valley Sugar-beet and Irrigated Land Company.

Comes now the said The State of Kansas, complainant, saving and reserving to itself all and all manner of advantage and exception which may be had and taken to the manifold errors, uncertainties and insufficiencies of the answer of the defendant The Arkansas Valley Sugar-beet and Irrigated Land Company to the amended bill of complaint, filed herein, for replication thereunto says that it does and will aver, maintain and prove its said amended bill of complaint to be true, certain and sufficient in the law to be answered unto by the said defendant, and that the answer of the said defendant is very uncertain, evasive and insufficient in the law to be replied unto by this complainant; without this, that any other matter or thing in the said answer contained material or effectual in the law to be replied unto and not herein and hereby well and sufficiently replied unto, confessed or avoided, traversed or denied, is true; all which matters and things this complainant is ready to aver, maintain and prove as this honorable court shall direct; and the said complainant humbly prays as in and by its said amended bill it has already prayed.

C. C. COLEMAN,
Attorney-General.

N. H. LOOMIS,
F. DUMONT SMITH,
S. S. ASHBAUGH,
Attorneys for Complainant.

[Endorsed:] Supreme Court U. S. October term, 1903. Term No. 7, orig'l. The State of Kansas, complainant, vs. The State of Colorado *et al.* Replication of complainant to separate answer of defendant The Arkansas Valley Sugar Beet & Irrigated Land Co. Filed March 7, 1904.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant, vs. THE STATE OF COLORADO and THE BESSEMER Ditch Company, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan, and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants.	No. 7, Original, Oct. Term, 1903.

Replication of the Complainant to the Separate Answer of the Defendant The Fort Lyon Canal Company.

C. C. Coleman, attorney-general.
N. H. Loomis, F. Dumont Smith, S. S. Ashbaugh, attorneys for complainant.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO and THE BESSEMER DITCH COMPANY, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants. } No. —.

Replication of the Complainant to the Separate Answer of the Defendant The Fort Lyon Canal Company.

Comes now the said The State of Kansas, complainant, saving and reserving to itself all and all manner of advantage and exception which may be had and taken to the manifold errors, uncertainties and insufficiencies of the answer of the defendant The Fort Lyon Canal Company to the amended bill of complaint, filed herein, for replication thereunto says that it does and will aver, maintain and prove its said amended bill of complaint to be true, certain and sufficient in the law to be answered unto by the said defendant, and that the answer of the said defendant is very uncertain, evasive and insufficient in the law to be replied unto by this complainant; without this, that any other matter or thing in the said answer contained material or effectual in the law to be replied unto and not herein and hereby well and sufficiently replied unto, confessed or avoided, traversed or denied, is true; all which matters and things this complainant is ready to aver, maintain and prove as this honorable court shall direct; and the said complainant humbly prays as in and by its said amended bill it has already prayed.

C. C. COLEMAN,
Attorney-General.

N. H. LOOMIS,
F. DUMONT SMITH,
S. S. ASHBAUGH,
Attorneys for Complainant.

[Endorsed:] Supreme Court U.S. October term, 1903 Term No. 7, orig'l The State of Kansas, complainant, vs. The State of Colorado *et al.* Replication of complainant to separate answer of defendant The Fort Lyon Canal Co. Filed March 7, 1904.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO and THE Bessemer Ditch Company, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants.

No. 7, Original, Oct. Term, 1903.

Replication of the Complainant to the Separate Answer of the Defendant The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company.

C. C. Coleman, attorney-general.
N. H. Loomis, F. Dumont Smith, S. S. Ashbaugh, attorneys for complainant.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO and THE BESSEMER DITCH Company, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants. } No. —.

Replication of the Complainant to the Separate Answer of the Defendant The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company.

Comes now the said The State of Kansas, complainant, saving and reserving to itself all and all manner of advantage and exception which may be had and taken to the manifold errors, uncertainties and insufficiencies of the answer of the defendant The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company to the amended bill of complaint, filed herein, for replication thereunto says that it does and will ever, maintain and prove its said amended bill of complaint to be true, certain and sufficient in the law to be answered unto by the said defendant, and that the answer of the said defendant is very uncertain, evasive and insufficient in the law to be replied unto by this complainant; without this, that any other matter or thing in the said answer contained material or effectual in the law to be replied unto and not herein and hereby well and sufficiently replied unto, confessed or avoided, traversed or denied, is true; all which matters and things this complainant is ready to aver, maintain and prove as this honorable court shall direct; and the said complainant humbly prays as in and by its said amended bill it has already prayed.

C. C. COLEMAN,
Attorney General.

N. H. LOOMIS,
F. DUMONT SMITH,
S. S. ASHBAUGH,
Attorneys for Complainant.

[Endorsed:] Supreme Court U. S. October term, 1903 Term No. 7, orig'l The State of Kansas, complainant vs. the State of Colorado *et al.* Replication of the complainant to the separate answer of the defendant The Rocky Ford Canal, Reservoir, Land, Loan & Trust Co. Filed March 7, 1904.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO and THE BESSEMER Ditch Company, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants.

No. 7, Original, Oct. Term, 1903.

Replication of the Complainant to the Separate Answer of the Defendant The Catlin Consolidated Canal Company.

C. C. Coleman, attorney-general.
N. H. Loomis, F. Dumont Smith, S. S. Ashbaugh, attorneys for complainant.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO and THE BESSEMER DITCH COMPANY, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan ad Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants. } No. —.

Replication of the Complainant to the Separate Answer of the Defendant The Catlin Consolidated Canal Company.

Comes now the said The State of Kansas, complainant, saving and reserving to itself all and all manner of advantage and exception which may be had and taken to the manifold errors, uncertainties and insufficiencies of the answer of the defendant The Catlin Consolidated Canal Company to the amended bill of complaint, filed herein, for replication thereunto says that it does and will aver, maintain and prove its said amended bill of complaint to be true, certain and sufficient in the law to be answered unto by the said defendant, and that the answer of the said defendant is very uncertain, evasive and insufficient in the law to be replied unto by this complainant; without this, that any other matter or thing in the said answer contained material or effectual in the law to be replied unto and not herein and hereby well and sufficiently replied unto, confessed or avoided, traversed or denied, is true; all which matters and things this complainant is ready to aver, maintain and prove as this honorable court shall direct; and the said complainant humbly prays as in and by its said amended bill it has already prayed.

C. C. COLEMAN,
Attorney General.

N. H. LOOMIS,
E. DUMONT SMITH,
S. S. ASHBAUGH,
Attorneys for Complainant.

[Endorsed:] Supreme Court U. S. October term, 1903. Term No. 7, orig'l. The State of Kansas, complainant, vs. The State of Colorado *et al.* Replication of the complainant to separate answer of defendant The Catlin Consolidated Canal Co. Filed March 7, 1904.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO and THE BESSEMER Ditch Company, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants.

No. 7, Original, Oct. Term, 1903.

Replication of the Complainant to the Separate Answer of the Defendant The Oxford Ditch Company.

C. C. Coleman, attorney-general.
N. H. Loomis, F. Dumont Smith, S. S. Ashbaugh, attorneys for complainant.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO and THE BESSEMER DITCH Company, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants. } No. —.

Replication of the Complainant to the Separate Answer of the Defendant The Oxford Ditch Company.

Comes now the said The State of Kansas, complainant, saving and reserving to itself all and all manner of advantage and exception which may be had and taken to the manifold errors, uncertainties and insufficiencies of the answer of the defendant The Oxford Ditch Company to the amended bill of complaint, filed herein, for replication thereunto says that it does and will aver, maintain and prove its said amended bill of complaint to be true, certain and sufficient in the law to be answered unto by the said defendant, and that the answer of the said defendant is very uncertain, evasive and insufficient in the law to be replied unto by this complainant; without this, that any other matter or thing in the said answer contained material or effectual in the law to be replied unto and not herein and hereby well and sufficiently replied unto, confessed or avoided, traversed or denied, is true; all which matters and things this complainant is ready to aver, maintain and prove as this honorable court shall direct; and the said complainant humbly prays as in and by its said amended bill it has already prayed.

C. C. COLEMAN,
Attorney General.

N. H. LOOMIS,
F. DUMONT SMITH,
S. S. ASHBAUGH,
Attorneys for Complainant.

[Endorsed:] Supreme court U. S. October term, 1903. Term No. 7, orig'l. The State of Kansas complainant vs. The State of Colorado *et al.* Replication of complainant to separate answer of defendant The Oxford Ditch Co. Filed March 7, 1904.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant, vs. THE STATE OF COLORADO and THE BESSEMER Ditch Company, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; the Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation; and The Bent Otero Improvement Company, a Corporation, Defendants.	No. 7, Original, Oct. Term, 1903.

Replication of the Complainant to the Separate Answer of the Defendant, The Laguna Canal Company (in the Amended Bill Called The Lake Canal Company, a Corporation).

C. C. Coleman, attorney-general.
N. H. Loomis, F. Dumont Smith, S. S. Ashbaugh, atttorneys for complainant.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO and THE BESSEMER DITCH Company, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants. } No. —.

Replication of the Complainant to the Separate Answer of the Defendant The Laguna Canal Company (in the Amended Bill Called The Lake Canal Company, a Corporation).

Comes now the said The State of Kansas, complainant, saving and reserving to itself all and all manner of advantage and exception which may be had and taken to the manifold errors, uncertainties and insufficiencies of the answer of the defendant The Laguna Canal Company (in the amended bill called The Lake Canal Company) a corporation, to the amended bill of complaint, filed herein, for replication thereunto says that it does and will aver, maintain and prove its said amended bill of complaint to be true, certain and sufficient in the law to be answered unto by the said defendant, and that the answer of the said defendant is very uncertain, evasive and insufficient in the law to be replied unto by this complainant; without this, that any other matter or thing in the said answer contained material or effectual in the law to be replied unto and not herein and hereby well and sufficiently replied unto, confessed or avoided, traversed or denied, is true; all which matters and things this complainant is ready to aver, maintain and prove as this honorable court shall direct; and the said complainant humbly prays as in and by its said amended bill it has already prayed.

C. C. COLEMAN,
Attorney-General.

N. H. LOOMIS,
F. DUMONT SMITH,
S. S. ASHBAUGH,
Attorneys for Complainant.

[Endorsed:] Supreme Court U. S. October term, 1903. Term No. 7, orig'l. The State of Kansas, complainant, vs. The State of Colorado *et al.* Replication of complainant to separate answer of defendant The Laguna Canal Co. Filed March 7, 1904.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant, vs. THE STATE OF COLORADO and THE BESSEMER Ditch Company, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants.	No. 7, Original, Oct. Term, 1903.

Replication of the Complainant to the Separate Answer of the Defendant The Colorado Fuel and Iron Company.

C. C. Coleman, attorney-general.
N. H. Loomis, F. Dumont Smith, S. S. Ashbaugh, attorneys for complainant.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO and THE BESSEMER DITCH COMPANY, a Corporation; The Oxford Ditch Company, a Corporation; The Otero Canal Company, a Corporation; The Laguna Canal Company, a Corporation (in the Amended Bill Called The Lake Canal Company, a Corporation); The Riverside Ditch Company, a Corporation; The Catlin Consolidated Canal Company, a Corporation; The Graham Ditch Company, a Corporation; The Lamar Land and Canal Company, a Corporation; The Amity Canal and Reservoir Company, a Corporation; The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, a Corporation; The Fort Lyon Canal Company, a Corporation; The Colorado Land and Canal Company, a Corporation; The Great Plains Water Company, a Corporation; The Arkansas Valley Sugar-beet and Irrigated Land Company, a Corporation; The Colorado Fuel and Iron Company, a Corporation, and The Bent Otero Improvement Company, a Corporation, Defendants. } No. —.

Replication of the Complainant to the Separate Answer of the Defendant The Colorado Fuel and Iron Company.

Comes now the said The State of Kansas, complainant, saving and reserving to itself all and all manner of advantage and exception which may be had and taken to the manifold errors, uncertainties and insufficiencies of the answer of the defendant The Colorado Fuel and Iron Company to the amended bill of complaint, filed herein, for replication thereunto says that it does and will aver, maintain and prove its said amended bill of complaint to be true, certain and sufficient in the law to be answered unto by the said defendant, and that the answer of the said defendant is very uncertain, evasive and insufficient in the law to be replied unto by this complainant; without this, that any other matter or thing in the said answer contained material or effectual in the law to be replied unto and not herein and hereby well and sufficiently replied unto, confessed or avoided, traversed or denied is true; all which matters and things this complainant is ready to aver, maintain and prove as this honorable court shall direct; and the said complainant humbly prays as in and by its said amended bill it has already prayed.

C. C. COLEMAN,
Attorney-General

N. H. LOOMIS,
F. DUMONT SMITH,
S. S. ASHBAUGH,
Attorneys for Complainant.

[Endorsed:] Supreme Court U. S. October term, 1903. Term No. 7, original. The State of Kansas, complainant, vs. The State of Colorado *et al.* Replication of the complainant to the separate answer of defendant The Colorado Fuel and Iron Co. Filed March 7, 1904.

And afterwards, to wit, on the 14th day of March, A. D, 1904, a motion was filed in the words and figures following, viz:

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
v.
THE STATE OF COLORADO ET AL., Defendants. } No. 7, Original.

Motion on Behalf of the United States for Leave to Intervene.

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
v.
THE STATE OF COLORADO ET AL., Defendants. } No. 7, Original.

Motion on Behalf of the United States for Leave to Intervene.

The Attorney-General, on behalf of the United States, moves the court for leave to intervene in the above-entitled cause, and for such purpose to file therein its petition, a copy of which is attached hereto, marked "A."

As cause for this motion it is shown—

1. The cause presents several questions of law of general public interest, the determination of which will affect the public domain of the United States and the navigability of interstate streams.

2. The cause presents several questions of law, the determination of which will affect the administration and enforcement of several acts of Congress, and especially the so-called reclamation act of June 17, 1902 (32 Stat., 388).

3. The United States owns several thousands of acres of arid lands in Colorado and Kansas, within the watershed of the Arkansas river, which will be vitally affected by the determination of the questions of law involved in said cause.

4. The questions of law presented in said cause are of such character that their determination will vitally affect the interests of the United States and the general welfare.

P. C. KNOX,
Attorney-General.

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
v.
THE STATE OF COLORADO ET AL., Defendants. } No. 7, Original.

Notice of Motion on Behalf of the United States for Leave to Intervene.

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
v.
THE STATE OF COLORADO ET AL., Defendants. } No. 7, Original.

Notice of Motion on Behalf of the United States for Leave to Intervene.

To The State of Kansas, complainant in the above-entitled suit, and to The State of Colorado, The Bessemer Ditch Company, The Oxford Farmers' Ditch Company, The Otero Canal Company, The Laguna Company (in the amended bill of complaint by mistake called The Lake Canal Company), The Riverside Ditch Company, The Catlin Consolidated Canal Company, The Graham Ditch Company, The Lamar Land and Canal Company, The Amity Canal and Reservoir Company, The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, The Fort Lyon Canal Company, The Colorado Land and Canal Company, The Great Plains Water Company, The Arkansas Valley Sugar-beet and Irrigated Land Company, The Colorado Fuel and Iron Company, and The Bent-Otero Improvement Company, defendants therein:

You, and each of you, are hereby notified that on Monday, March 14, 1904, the Attorney-General of the United States will, on behalf of the United States, move the above court for leave to intervene in the above-entitled cause and for such purpose to file therein its petition. A copy of said proposed motion and petition are herewith attached.

P. C. KNOX,
Attorney-General.

Copy of enclosed notice served on me March 2d, 1904.

C. C. COLEMAN, Att'y Gen.

[Endorsed:] Supreme Court U. S. October term, 1903 Term No. 7, orig'l. The State of Kansas, complainant, vs. The State of Colorado *et al.* Motion on behalf of the U. S. for leave to intervene, with notice and acceptance of service. Filed March 14, 1904.

And on the same day, to wit, the 14th day of March, A. D. 1904, the following entry appears of record, viz:

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL. } No. 7, Original.

Mr. Solicitor General Hoyt submitted to the consideration of the court a motion for leave to the United States to intervene herein.
March 14th, 1904.

And on the same day, to wit, on the 14th day of March, A. D. 1904, the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL. } No. 7, Original.

On motion of Mr. Platt Rogers of counsel for the defendants, leave is hereby granted to file a motion to dismiss herein, and said motion was ordered to be submitted on printed briefs on or before April 29th next.
March 14th, 1904.

And on the same day, to wit, the 14th day of March, A. D. 1904, a motion was filed in the words and figures following, viz:

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
v.
THE STATE OF COLORADO ET AL., Defendants. } No. 7, Original.

Motion on Behalf of the Arkansas Valley Sugar Beet and Irrigated Land Company *et al.*, to Dismiss.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
v.
THE STATE OF COLORADO ET AL., Defendants. } Original Proceeding No. 7. Motion.

Now come the defendants, The Arkansas Valley Sugar Beet and Irrigated Land Company, The Graham Ditch Company, The Colo-

rado Fuel & Iron Company, The Fort Lyon Canal Company, The Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, The Catlin Consolidated Canal Company, The Oxford Farmers Ditch Company and The Lake Canal Company, and jointly and severally move the court to dismiss the bill and all proceedings herein as against said defendants, for want of jurisdiction, as apparent on the bill, the separate answers of said defendants and the replications filed thereto:

1st. Because it appears by the bill and the several separate answers that the controversy is between the State of Kansas and citizens and residents of Kansas, as the owners of lands along the Arkansas river in said State, claiming certain rights, as riparian proprietors, in the flow of said river, and said defendants, as appropriators of the waters of said river in Colorado, claiming the right to divert and use said waters for irrigation purposes adversely to the claims of each and all of said owners of lands in Kansas, and that all or a representative part of said owners of lands in Kansas are necessary parties to a determination of said controversy.

2nd. Because it appears by the several answers filed herein that certain citizens and residents of the State of Kansas are the owners of lands in Colorado, under certain canals of said defendants and appropriators and users, through said canals, of the waters of said Arkansas river adversely to the claims of the owners of lands along said river in said State of Kansas, and that they are necessary parties to a determination of the controversy.

3rd. Because, notwithstanding the State of Kansas and the several citizens and residents of said State owning lands along the Arkansas river in said State, or some of them, may have been originally entitled to the continued flow of the waters of said river, as claimed in the bill of complaint, it appears by the several answers filed herein that each and all of the said owners of lands have lost, waived, surrendered or abandoned all right to the flow of said river as against said defendants and by their conduct are estopped to assert or maintain their said claim, and they are therefore necessary parties to a determination of the rights asserted by said defendants to the waters of said river.

4th. Because, in the several separate answers filed herein, certain citizens and residents of the State of Kansas, owners of land along said river in said State, in whose behalf said bill was filed, are named as persons not entitled to the relief demanded in said bill, by reason of laches, estoppel, surrender or abandonment or by the operation of the statutes of limitation of the State of Kansas, and certain others are named as not entitled to the relief demanded because the title to their said lands was acquired from the Government of the United States, subject to the vested and accrued rights of said defendants to the use of the waters of said river in the State of Colorado for irrigation purposes; that all of said persons so named, together with all other persons in the like situation, are necessary

parties to a determination of the rights of said defendants, as alleged in said several answers.

5th. Because the complainant, instead of excepting to the sufficiency of the allegations of said separate answers, concerning the rights of said defendants against the citizens and residents of Kansas owning land along said Arkansas river in Kansas, and suggesting the necessity of their being made parties to this proceeding, and instead of in any way seeking a determination of the questions thus presented in advance of further hearing, has filed its reply traversing the allegations made in said answers and has assumed the right to have said issues determined, but without making said citizens and residents of Kansas parties, to the end that the claims made by said defendants as against said persons may be established and said persons thereby concluded.

6th. Because the issues tendered by the pleadings filed herein do not disclose a controversy justiciable in this court within the meaning of the Constitution and statutes of the United States which create and define the original jurisdiction of this court.

PLATT ROGERS,
JOHN F. SHAFROTH,
FRANK E. GREGG,
Attorneys of the Arkansas Valley Sugar Beet and Irrigated Land Company.
C. C. GOODALE,
Attorney of the Graham Ditch Company.
D. C. BEAMAN,
Attorney of the Colorado Fuel and Iron Company.
C. E. GAST,
Attorney of the Fort Lyon Canal Co.
F. A. SABIN,
Attorney of the Rocky Ford Canal, Reservoir, Land, Loan and Trust Company, the Catlin Consolidated Canal Co., the Oxford Farmers Ditch Company and the Lake Canal Company.

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL., Defendants.

To the State of Kansas, complainant in the above entitled suit:

You are hereby notified that on Monday, March 14th, 1904, the undersigned will on behalf of the several individual defendants named move the above court for leave to file their motion to dismiss the bill of complaint and the proceedings herein, a copy of said motion being hereto attached, and upon the filing of the same will

upon said date apply to said court to fix a day for the argument of said motion.

PLATT ROGERS,
JOHN F. SHAFROTH,
FRANCIS E. GREGG,
Attorneys for the Arkansas Sugar Beet and Irrigated Land Company.
C. C. GOODALE,
Attorney for the Graham Ditch Company.
D. C. BEAMAN,
Attorney for the Colorado Fuel & Iron Company.
C. E. GAST,
Attorney for the Fort Lyon Canal Company.
F. A. SABIN,
Attorney of the Rocky Ford Canal, Reservoir, Land, Loan & Trust Company, the Catlin Consolidated Canal Company, the Oxford Farmers Ditch Company and the Lake Canal Company.

Due service of the foregoing notice and of the motion to dismiss therein referred to is hereby acknowledged to have been made on the attorney general of Kansas at Topeka, Kansas, this 7″ day of March, A. D. 1904 at 2 o'clock.

C. C. COLEMAN,
Attorney General of the State of Kansas,
Per JAY F. CLORE,
Ass't Att'y Gen'l.

Endorsed: In the Supreme Court of the United States. The State of Kansas v. The State of Colorado *et al.* No. 7, original.
Endorsed: Supreme Court, U. S., October term, 1903. Term No. 7, orig'l. The State of Kansas, complainant, vs. The State of Colorado *et al.* Motion on behalf of the Arkansas Valley Sugar Beet & Irrigated Land Company *et al.*, to dismiss. Filed Mar. 14″, 1904.

And afterwards, to wit, on the 21st day of March A. D. 1904, the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL. } No. 7, Original.

On consideration of the motion of the United States for leave to intervene in this cause,
It is now here ordered by the court that said motion be, and the same is hereby granted.
March 21st, 1904.

And on the same day, to wit, on the 21st day of March, A. D. 1904, a petition of intervention was filed in the words and figures following, viz:

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
v.
THE STATE OF COLORADO ET AL., Defendants. } No. 7, Original.

Petition of Intervention on Behalf of the United States.

P. C. Knox, Attorney-General.

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
v.
THE STATE OF COLORADO ET AL., Defendants. } No. 7, Original.

Petition of Intervention on Behalf of the United States.

To the honorable the Chief Justice and the associate justices of the Supreme Court of the United States:

Comes now the United States of America, by Philander C. Knox, Attorney-General, and by leave of the court first had and obtained files this its petition of intervention in the above-entitled cause, and alleges and shows as follows:

1. That the Arkansas river mentioned and described in complainant's bill of complaint is a natural stream of water and has its rise and source in the Rocky mountains, in the State of Colorado; thence flows through said State in a southeasterly and easterly direction for approximately 280 miles to a point on the boundary line which separates Kansas and Colorado, near the thirty-eighth degree north latitude, at which point it enters the State of Kansas; thence flows easterly, southeasterly, northeasterly, and southeasterly through the last-named State, a distance of about 310 miles to a point about 6 miles east of the ninety-seventh degree west longitude, where it enters the Territory of Oklahoma; thence flows through said Territory, the Indian Territory, and the State of Arkansas, and enters into the Mississippi river at the eastern boundary of said State. That said stream is not navigable in the States of Colorado and Kansas and the Territory of Oklahoma, but is navigable in the State of Arkansas and in the Indian Territory.

2. That all the lands lying within the watershed of said stream west of the ninety-ninth degree longitude are situated in what is known as the arid region of the United States—that is, within that part of the United States where the normal annual rainfall is not

sufficient to supply the moisture necessary to enable the soil to produce by cultivation agricultural or other crops in paying quantities.

3. That within the watershed of said stream west of the ninety-ninth degree longitude there are about 1,000,000 acres of lands belonging to the United States which are now uninhabitable, unproductive, and unsalable, for the reason that the normal annual rainfall does not supply sufficient moisture to enable the soil to produce crops in paying quantities.

4. That only by means of irrigation—that is by taking and diverting the waters of said stream and its tributaries, or by impounding and storing the flood and other waters arising in said watershed, and conducting the waters so taken, diverted, impounded, and stored to and upon the lands in said watershed so owned by the United States—can any of said lands be reclaimed from their arid condition, rendered inhabitable and salable, and made to produce crops in paying quantities.

5. That because of the insufficient rainfall in the arid region to supply the moisture necessary to render the soil capable of producing crops in paying quantities, and for the reason that the lands in said arid region can only be made to produce crops in such quantities by irrigation, the common-law doctrine of riparian rights has, by usage and custom of the inhabitants in said region, and by statute law of some of the States and Territories in which the arid region is situated, been abrogated, and in lieu thereof there has grown up and been established the doctrine that the waters of natural streams, also the flood and other waters in said region, may be impounded, appropriated, diverted, and used for the purpose of reclaiming and irrigating the arid lands therein, and for other lawful and beneficial purposes; and that the prior appropriation of such waters, followed by the continuous use for and application to the purposes named, gives a right in and to the waters appropriated superior to any right or rights asserted or claimed by the owner or owners of riparian lands bordering on the stream from which the appropriation is made or in which said waters would otherwise flow, and superior to any right or rights claimed or asserted under any and all subsequent appropriations of said waters.

6. That it would seem, from Congressional legislation, from the decisions of this court and from executive acts, the United States has sanctioned and approved the aforesaid usage, custom, and statute law respecting the abrogation of the common-law doctrine of riparian rights, and respecting the doctrine of the appropriation and use of waters for irrigation and other beneficial purposes, and has recognized that the common-law doctrine of riparian rights is inapplicable to the public lands owned by it in the arid region, and as applicable thereto has approved the doctrine in respect to the appropriation and use of water for irrigation and other beneficial purposes, provided such appropriation and use does not tend to destroy

or interfere with the navigability of the streams into which such waters flow.

7. That in accordance with and in reliance upon the above-mentioned recognized doctrine respecting the appropriation and use of waters for irrigation and for other beneficial purposes, the inhabitants of the arid region in the United States have, by appropriating and using upon the arid lands the waters of natural streams, also flood and other waters, reclaimed and made productive and profitable not less than 10,000,000 acres of land, which now provide homes for and support a population of several millions; that in accordance with and in reliance upon said doctrine the inhabitants of Colorado and Kansas, within the watershed of the Arkansas river, by appropriating and using upon the lands within said watershed the waters of said river and its tributaries, have reclaimed and made productive and profitable about 200,000 acres of land, which have provided and now provide homes for and support a population of many thousands.

8. That the common-law doctrine of riparian rights is inapplicable to riparian lands within the arid region; for if such doctrine were held to be applicable to riparian lands in said region, and enforced, the lands in said region belonging to the United States would forever remain uninhabitable, unproductive, and unsalable, and the area of ten million acres now irrigated therein, and supporting a population of several million people must be deprived of water for irrigation and be returned to its original desert condition; that only by the application to the lands in both public and private ownership in the arid region of the doctrine in respect to the appropriation and use of the waters of natural streams, of flood and other waters, for irrigation and other beneficial purposes, can such lands continue productive and additional large areas be reclaimed and rendered inhabitable, productive, and salable.

9. Acting upon the assumption that only the doctrine respecting the appropriation and use of the waters of natural streams and of flood and other waters, for irrigation and other beneficial purposes, was applicable to the public lands in said region, Congress passed an act, which was approved by the President June 17, 1902 (32 Stat., 388), commonly called and hereinafter referred to as the "reclamation act," the object, intent, and purpose of which act is to promote the interests of the United States and to enhance the general welfare by providing the means whereby reservoirs and dams may be erected and maintained by the United States in the arid region to catch, store, and impound the unappropriated waters of the natural streams in said region, and the flood and other waters arising within the watersheds of said streams, to the end that said waters may be used to reclaim, render inhabitable and salable, and make productive and profitable the lands now belonging to the United States within the arid region and other lands in private ownership in said region which could not otherwise be used to raise agricultural crops.

10. That not less than 60,000,000 acres of land belonging to the

United States within the arid region, which are now uninhabitable, unproductive, and unsalable, can be reclaimed and rendered inhabitable, productive, and salable, provided that under said act reservoirs and dams are erected and maintained to catch, store, and impound the unappropriated waters of natural streams in said region, and to catch, store, and impound the flood and other waters therein, and provided such waters when stored and impounded are conducted to and used upon such arid lands as by said act intended.

11. That the amount of land now owned by the Government which can be so reclaimed and made inhabitable, productive, and salable will, when so reclaimed, provide homes for and support a population of many millions.

12. That within the watershed of the Arkansas river, west of the ninety-ninth degree west, about 100,000 acres of land, belonging to the Government, which are now uninhabitable, unproductive, and unsalable, can be reclaimed and rendered inhabitable, productive, and salable, provided reservoirs and dams are erected and constructed to catch, store, and impound unappropriated waters of said river, as above described, and the flood and other waters arising within its watershed; and provided such waters, when so stored and impounded, are conducted and used upon said lands for the purpose of reclaiming and irrigating the same.

13. That the lands situated in said watershed west of the ninety-ninth meridian west, which can be so reclaimed and irrigated, will, when so reclaimed and irrigated, be capable of supporting a population of not less than 50,000.

14. That the officers of the United States whose duty it is to administer said act and to enforce its provisions are now endeavoring to carry it into effect, and have already expended about $1,000,000 in exploring for, selecting, procuring, and setting apart sites upon which reservoirs and dams contemplated by the act can be constructed and maintained; that said officers have let contracts, under the provisions of said act, for the erection and construction of reservoirs and dams which, when completed, will cost over $2,000,000 and will have a storage capacity of water sufficient to reclaim and make productive, inhabitable, and salable not less than 500,000 acres of the arid lands belonging to the United States, which land, when so reclaimed, will sustain a population of not less than 250,000; and that by surveys and investigations already made under said reclamation act plans of irrigation are under consideration for the irrigation of about 1,000,000 acres more of arid public lands, at a probable cost of over $20,000,000.

15. That there is now available, under the provisions of said act, the sum of more than sixteen millions ($16,000,000) of dollars, for the procuring, selecting, and setting apart of reservoir sites and for the constructing and maintaining of reservoirs and dams; and that the proceeds from the disposal of public lands will add to the fund at the rate of several millions of dollars per year.

16. That the State of Kansas, in and by its amended bill of com-

plaint herein, claims that it owns riparian lands in the valley of said Arkansas river, in said State, and as such riparian owner contends that it is entitled to a decree compelling the State of Colorado and its inhabitants to permit all the waters of the Arkansas river within the State of Colorado to flow into the State of Kansas uninterrupted, unimpeded, and undiminished. That such contention on the part of said State in effect challenges the validity of the doctrine which prevails in the arid region in respect to the waters of natural streams, and of flood and other waters, which doctrine the Government of the United States has sanctioned and approved, and the maintenance of which is essential to the interests of the United States and the general welfare of the citizens thereof.

17. That the State of Colorado, in and by its answer to the complainant's amended bill of complaint, contends that all the waters of the Arkansas river and its tributaries, and all the waters within the watershed of said river from whatsoever source arising in said State, belong to it in its sovereign capacity; and that as such owner, and in its sovereign capacity, it can authorize its inhabitants to divert and appropriate all the waters of the Arkansas river within the boundaries of said State, leaving none thereof to flow into the State of Kansas for the use of said State or its inhabitants, or for the use of the United States, notwithstanding said State of Kansas or its inhabitants, or the United States may have previously made appropriations of water from said river in Kansas and used said waters continuously since said appropriations were made, in the reclamation and irrigation of lands in said State, or for any lawful and beneficial purposes. This contention on the part of the State of Colorado, if sustained, would limit, by State lines, the aforesaid doctrine of prior appropriation, as applied to interstate streams; would permit said State to assert an absolute dominion over and a sole ownership of the waters within said State flowing within the natural beds of the Arkansas river and other interstate streams; would allow it to authorize its inhabitants to appropriate and use all of said waters to the damage of prior appropriations in adjoining and other States through which said interstate streams extend, irrespective of whether such prior appropriators were individuals, States, or the United States; and would tend to destroy the navigable capacity of the Arkansas river and other interstate streams.

18. That neither the contention of the State of Colorado nor the contention of the State of Kansas is correct; nor does either contention accord with the doctrine prevailing in the arid region in respect to the waters of natural streams and of flood and other waters. That either contention, if sustained, would defeat the object, intent, and purpose of the reclamation act, prevent the settlement and sale of the arid lands belonging to the United States, and especially those within the watershed of the Arkansas river west of the ninety-ninth degree west longitude, and would otherwise work great damage to the interests of the United States.

19. That the passage of the reclamation act is the first direct and

positive declaration of the intention of the Congress of the United States to undertake active operations in relation to its dominion and control over the unappropriated waters on the public domain from time to time, as feasible irrigation projects are found on any stream, which can be developed for purposes beneficial to the United States and all of the citizens thereof; and that while no definite action has as yet been determined upon with reference to the application of the terms and conditions of said act to the Arkansas river, it may be deemed desirable for the proper authorities of the United States, acting under the Secretary of the Interior, to commence operations upon said river at any time; and it therefore becomes important and necessary to determine the status of the United States and the extent and character of its interests, its powers, its control, and its rights as to the disposal of the unappropriated water of said river, at the earliest possible opportunity consistent with the progress of the case in which this petition for intervention is filed.

20. This petitioner therefore prays that it may be permitted to intervene in this case and court, and may be permitted to take proofs, examine witnesses, and be heard in argument; and also, that this petitioner shall have such other and further relief in the premises as shall be found agreeable to equity and good conscience.

P. C. KNOX,
Attorney-General.

[Endorsed:] Supreme Court U. S. October term, 1903 Term No. 7, orig'l The State of Kansas, complainant, vs. The State of Colorado *et al.* Petition of intervention on behalf of the United States Filed March 21, 1904

And afterwards, to wit, on the 29th day of April, A. D. 1904, an appearance for complainant was filed in the words and figures following, viz:

Order for Appearance.

Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Comp't,
vs.
THE STATE OF COLORADO ET AL. } No. 7, Orig'l.

The clerk will enter my appearance as counsel for the complainant.

(Name.) F. DUMONT SMITH,
(P. O. Address.) Kinsley, Kan.

☞ NOTE.—Must be signed by a member of the bar of the Supreme Court United States. Individual and not firm names must be signed.

[Endorsed:] Supreme Court U. S. October term, 1903 Term No. 7, orig'l. Appearance for comp't Filed April 29, 1904

And on the same day, to wit, the 29th day of April A. D. 1904, a motion was filed in the words and figures following, viz:

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL.

Motion.

Now come the complainant above named and moves the court for leave to file its answer to the bill of intervention herein filed by the United States.

C. C. COLEMAN &
F. DUMONT SMITH,
Attorneys for Complainant.

Endorsed: Supreme Court, U. S., October term, 1903. Term No 7, orig'l. The State of Kansas, complainant, v. The State of Colorado *et al.* Motion of complainant for leave to file answer to petition of intervention. Filed April 29, 1904.

And afterwards, to wit, on the 29th day of April, A. D. 1904, the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL.
No. 7, Original.

On motion of Mr. F. Dumont Smith, of counsel for the complainant, leave is hereby granted to file the answer of the State of Kansas to the intervention of the United States herein.
April 29th, 1904.

And on the same day, to wit, the 29th day of April, A. D. 1904, an answer was filed in words and figures following, viz:

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL., Defendants. } No. 7, Original.

Answer of the State of Kansas to the Petition of Intervention on Behalf of the United States.

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL., Defendants. } No. 7, Original.

Answer of the State of Kansas to the Petition of Intervention on Behalf of the United States.

This complainant, now and at all times hereafter saving to itself all and all manner of benefit or advantage of exception or otherwise that can or may be had or taken to the many errors, uncertainties or imperfections in the said petition of intervention, for answer thereto, or to so much thereof as this complainant is advised it is material or necessary for it to make answer to, answering, says:

That it denies each and every, all and singular the allegations contained in said petition of intervention which are contrary to or in conflict with the amended bill of complaint filed herein.

C. C. COLEMAN,
Attorney-General,
N. H. LOOMIS,
F. DUMONT SMITH,
S. S. ASHBAUGH,
Attorneys for Complainant.

[Endorsed:] Supreme Court U. S. October term, 1903. Term No. 7, orig'l. The State of Kansas, complainant, vs. The State of Colorado *et al.* Answer of the State of Kansas to petition of intervention of the United States. Filed April 29, 1904.

And afterwards, to wit, on the 2d day of May, A. D. 1904, the following entry appears of record, viz:

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL. } No. 7, Original.

The motion to dismiss the bill of complaint herein was submitted to the consideration of the court on printed arguments by Mr. Platt

Rogers, Mr. John F. Shafroth, Mr. Frank E. Gregg, Mr. C. C. Goodale, Mr. D. C. Beaman, Mr. C. E. Gast, and Mr. F. A. Sabin, in support of the same, and Mr. C. C. Coleman, Mr. N. H. Loomis, Mr. F. Dumont Smith, and Mr. S. S. Ashbaugh, in opposition thereto.
May 2d, 1904.

And afterwards, to wit, on the 16th day of May, A. D. 1904, the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL. } No. 7, Original.

It is ordered by the court that the further consideration of the motion to dismiss herein be, and the same is hereby, postponed until the hearing of the cause on its merits.
May 16th, 1904.

And on the same day, to wit, on the 16th day of May, A. D. 1904, a motion was filed in words and figures following, viz:

In the Supreme Court of the United States, October Term, 1903.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL., Defendants;
The United States, Intervener. } No. 7, Original.

Motion for Appointment of a Special Commissioner to Take Testimony.

Come now the complainant, the defendants and the intervener in the above-entitled cause, by their respective attorneys, and move the court that Granville A. Richardson, a member of the bar of this court, and a resident of the Territory of New Mexico, be appointed a special commissioner, under the rules of the court, relating to masters in chancery, to take the testimony in this cause and to report the same to the court without findings of fact or his conclusions of law.

THE STATE OF KANSAS,
C. C. COLEMAN, Attorney General,
By —— ——, Its Attorneys.
THE STATE OF COLORADO ET AL.,
By N. C. MILLER, Att'y Gen'l, Their Attorneys.
THE UNITED STATES, Intervener,
By P. C. KNOX, Attorney General.

Endorsed: In the Supreme Court of the United States, October term, 1903. The State of Kansas, complainant, v. The State of Colorado *et al.*, defendants, The United States, intervener. No. 7, original. Motion for appointment of a special commissioner to take testimony and report the same.

Endorsed: Supreme Court U. S., October term, 1903. Term No. 7, original. The State of Kansas, complainant, vs. The State of Colorado *et al.* Motion for appointment of special commissioner to take testimony, Filed May 16, 1904.

And on the same day, to wit, on the 16th day of May, A. D. 1904, the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1903.
In Equity.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL.; The United States, Intervenor. } No. 7, Original.

This cause coming on to be heard on the application of the parties duly appearing by their counsel, for the appointment of a special commissioner to take testimony herein, and their stipulation in regard to the same heretofore filed by leave, said application and stipulation having been duly considered;

It is ordered that Granville A. Richardson, a member of this bar and a resident of the Territory of New Mexico, be and he is hereby, appointed a commissioner to take and return the testimony in this cause, with the powers of a master in chancery as provided in the rules of this court; but said commissioner shall not make any findings of fact or state any conclusions of law.

It is further ordered, that the taking of testimony on complainant's behalf shall begin on or before the fifteenth day of July, A. D. 1904, at such place as counsel for complainant may designate, ten days' notice thereof to be given to counsel for defendants, and for the United States respectively, and shall be concluded on or before the fifteenth day of September, A. D. 1904, and that the taking of the testimony on behalf of the defendants shall commence on or before the first day of October A. D. 1904, and be concluded on or before the first day of February, A. D. 1905, ten days' notice of the place where such testimony will be taken being given to counsel for complainant and to the counsel for the United States.

That the taking of testimony on behalf of the United States as intervenor shall commence on or before the fifteenth day of February A. D. 1905, and be concluded on or before the fifteenth day of March, A. D. 1905, ten days' notice of the place where such testimony will be taken being given to counsel for complainant and defendants, respectively.

That testimony in rebuttal shall then be taken, five days' notice of the place being given, and shall be concluded on or before the fifteenth day of April, A. D. 1905, on which day the taking of testimony in the cause shall be closed.

Said commissioner shall report to the court the testimony taken by him without findings of fact or conclusions of law, with all convenient speed, and shall receive, as agreed by the parties, fifteen dollars per day for his compensation, and his actual expenses, an itemized statement of which shall accompany his report.

A stenographer, or stenographers to take and transcribe the testimony may be employed by agreement of the parties, the compensation for whose services shall be reported by the commissioner to be taxed in the costs.

May 16th, 1904.

And afterwards, to wit, on the 29th day of November A. D. 1904, a motion was filed in words and figures following, viz:

Supreme Court of the United States, October Term, 1904.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL., Defendants;
The United States, Intervenor.
} No. 7, Original.

Motion for Leave to Print and File Abstract of Evidence.

Now comes the complainant, The State of Kansas, by C. C. Coleman, the attorney general for the State of Kansas, also comes The State of Colorado and the other defendants by N. C. Miller, attorney general for the State of Colorado, also comes The United States, intervenor by Frank L. Campbell, Assistant Attorney General, and ask that the court make an order that the parties be allowed to prepare an abstract of the evidence taken and to be taken in the above entitled cause and for leave to print said abstract and to file it with the clerk of the court in lieu of printing the original evidence; and that the parties be allowed to file the original evidence as taken by the commissioner without printing the same; and that the parties be allowed to print the abstract upon terms to be agreed upon among themselves.

C. C. COLEMAN,
Attorney General of Kansas.
N. C. MILLER,
Attorney General of Colorado.
FRANK L. CAMPBELL,
Assistant Attorney General of the U.S.

Endorsed: In the Supreme Court of the United States. State of Kansas, complainant, vs. State of Colorado *et al.*, defendants, The United States, intervenor. Motion for leave to print and file abstract of evidence.

Endorsed: Supreme Court, U. S., October term, 1904. Term No. 7, original. The State of Kansas, complainant, v. The State of Colorado *et al.* Motion for leave to print and file abstract of evidence. Filed Nov. 29, 1904.

And on the same day, to wit, on the 29th day of November, A. D. 1904, the following order appears of record, viz:

Supreme Court of the United States, October Term, 1904.

THE STATE OF KANSAS, Complainant, vs. THE STATE OF COLORADO ET AL., Defendants; The United States, Intervenor.	No. 7, Original.

On motion of Mr. Assistant Attorney General Campbell of counsel for The United States, intervenor herein, and on consent of counsel for the respective parties to this cause,

It is now here ordered by the court that the parties to this cause be permitted to prepare and print an abstract of the evidence taken and to be taken in this cause, and to file the same with the clerk of this court in lieu of the printing of the original evidence.

It is further ordered that the commissioner appointed by this court to take and report the evidence in this cause shall, as soon as the evidence is taken and completed, file a written report of the same with the clerk of this court.

And it is further ordered that the parties be allowed to print said abstract at their own expense.

November 29th, 1904.

And afterwards, to wit, on the 30th day of January, A. D. 1905, a stipulation was filed in the words and figures following, viz:

In the Supreme Court of the United States, October Term, 1904.

THE STATE OF KANSAS, Complainant, vs. THE STATE OF COLORADO ET AL., Defendants; The United States, Intervenor.	No. 7, Original. In Equity.

It is hereby stipulated and agreed, by and between the complainant, The State of Kansas, and the defendants, The State of Colorado

et al., and The United States of America, intervenor, that the intervenor shall immediately commence the introduction of its evidence and shall conclude the same within sixty (60) days from this date:

That the State of Colorado, *et al.*, shall have sixty (60) days thereafter in which to conclude the taking of its evidence, and that thereafter the State of Kansas shall have thirty (30) days in which to conclude the taking of its evidence, whereupon the taking of evidence shall be concluded.

Dated at Denver, Colorado, this 20th day of January, A. D. 1905.

N. C. MILLER,
Attorney General of Colorado.
C. C. COLEMAN,
Attorney General of Kansas.
A. C. CAMPBELL,
Special Assistant to Attorney-General of the United States.

Endorsed: In the Supreme Court of the United States. State of Kansas, complainant, vs. State of Colorado, defendant, United States of America, intervenor. Stipulation.

Endorsed: Supreme Court, U. S. October Term, 1904. Term No. 7, orig'l. The State of Kansas, complainant, v. The State of Colorado *et al.* Stipulation as to taking testimony. Filed Jan. 30, 1905.

And on the same day, to wit, on the 30th day of January, A. D. 1905, the following order appears of record, viz:

In the Supreme Court of the United States, October Term, 1904.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL.; THE UNITED States, Intervenor. } No. 7, Original.

On motion of Mr. Assistant Attorney General Campbell, of counsel for the United States, and in pursuance of a stipulation of counsel for the respective parties this day filed,

It is now here ordered by the court that the United States, as intervenor, shall begin to take its evidence in said cause on the 20th day of January, 1905, and shall finish the taking of same within sixty days thereafter; that The State of Colorado and the other defendants shall have sixty days thereafter to present and finish taking their evidence; and that the State of Kansas shall have thirty days thereafter in which to present and finish taking its evidence in said cause.

January 30th, 1905.

And afterwards, to wit, on the 26th day of September, A. D. 1905, a motion was filed in the words and figures following, viz:

In the Supreme Court of the State of Kansas.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL., Defendants; THE United States, Intervenor.
} No. 7, Original.

Motion to Assign Case for Argument, &c.

Comes now C. C. Coleman, attorney general of the State of Kansas, and in behalf of the said complainant, The State of Kansas, moves this honorable court that a rule or an order be entered in this cause advancing the same upon the docket of the court and setting the same down for final argument before this court at a time to be fixed by the court, and a further rule or order specifying the time within which briefs and written arguments for the said complainant, the said defendants, and the said intervenor shall be filed with this proceeding, and such other and further orders in connection with the assignment of said cause for final hearing as to the court shall seem just, equitable, and reasonable.

C. C. COLEMAN,
Attorney General of Kansas.

N. H. LOOMIS,
F. DUMONT SMITH,
S. P. ASHBAUGH,
Of Counsel.

(Endorsed:) Supreme Court U. S., October term, 1905. Term No. 7, original. The State of Kansas, complainant, vs. the State of Colorado *et al.* Motion to fix day for hearing of cause and for an order as to filing of briefs. Filed Sept. 26th, 1905.

And afterwards, to wit, on the 10th day of October, A. D. 1905, the following entry appears of record, viz:

Supreme Court of the United States, October Term, 1905.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL.
} No. 7, Original.

Mr. C. C. Coleman, of counsel for the complainant, submitted to the consideration of the court a motion to fix a day for the hearing of this cause, and leave was granted counsel for the defendants to file a brief in relation thereto.

October 10, 1905.

And afterwards, to wit, on the 16th day of October, A. D. 1905, the following order appears of record, viz:

Supreme Court of the United States, October Term, 1905.

THE STATE OF KANSAS, Complainant,
vs.
THE STATE OF COLORADO ET AL.; THE UNITED States, Intervenor. } No. 7, Original.

On consideration of the application of all parties to this cause to fix a day for the hearing of this cause—

It is now here ordered by the court that this cause be, and the same is hereby, assigned for argument on Tuesday, October 9th 1906.

It is further ordered that counsel for the State of Kansas file their briefs within three months hereafter; that counsel for the State of Colorado *et al.* file their briefs within three months thereafter; and that counsel for the United States be allowed three months to file briefs thereupon.

October 16, 1905.

The abstract of evidence prepared under the order of November 29, 1904, follows:

In the Supreme Court of the United States.

THE STATE OF KANSAS, Complainant, vs. THE STATE OF COLORADO ET AL., Defendants. } No. 7, Original, October Term, 1904.

Abstract of Evidence.

Appearances.

Attorneys for complainant: C. C. Coleman, attorney general of Kansas; S. S. Ashbaugh, N. H. Loomis, F. Dumont Smith, of counsel;

Attorneys for defendant, the State of Colorado: Nathan C. Miller, attorney-general of Colorado, Irving B. Melville, assistant attorney general of Colorado; Joel F. Vaile, Charles D. Hayt, Platt Rogers, Charles W. Waterman, Frank E. Gregg, Clyde C. Dawson, of counsel;

Attorneys for the Colorado Fuel & Iron Company: David C. Beaman, Cass E. Herrington, Fred Herrington, E. Parmalee Prentice;

Attorneys for the Arkansas Valley Sugar Beet & Irrigated Land Company: Platt Rogers, John F. Shafroth, Frank E. Gregg;

Attorneys for the Fort Lyon Canal Company: Charles E. Gast, H. L. Lubers;

Attorney for the Rocky Ford Canal, Reservoir, Land, Loan & Trust Company; the Catlin Consolidated Canal Co.; the Oxford Farmers Ditch Company and the Lake Canal Company: F. A. Sabin;

Attorney for the Graham Ditch Company: C. C. Goodale;

Attorneys for the United States as intervenor: Henry M. Hoyt, Solicitor General; Frank L. Campbell, assistant attorney general for the Interior Department; A. C. Campbell, special assistant to the Attorney General.

Stipulation in Regard to Objections.

It is hereby stipulated and agreed by the parties to this suit that each party hereby retains the right to refer to and insist upon any and all objections made by such party appearing in the original record, without repetition in this abstract. Such objections as shall be insisted upon shall be referred to in the briefs of counsel.

It is further stipulated and agreed that the defendants duly objected—

First. To all evidence with reference to the navigation of the Arkansas river and the effect upon such navigation of irrigation in the State of Colorado.

Second. To all evidence with reference to a certain power plant or canal located in the vicinity of Arkansas City, Kansas, and the

effect upon the supply of water for said canal said to have been produced by irrigation in the State of Colorado.

Third. To all evidence with reference to irrigation in western Kansas, and particularly with reference to the priority of right to the use of water for irrigation in western Kansas.

Fourth. To all evidence with reference to the effect in other States of taking water in Colorado for irrigation from streams other than the Arkansas river.

Fifth. To the opinions of all witnesses as to the effect upon the administration of the reclamation act and to the effect upon other States of the doctrine giving the State having the source of supply of the natural streams the prior right to use the waters of those streams for irrigation.

The evidence covered by the above objections was all objected to as incompetent, irrelevant and immaterial under the issues in this case.

Direct Evidence on Behalf of the State of Kansas.

Witnesses testified as follows:

WICHITA, KANSAS, August 15–21, 1904.

M. M. MURDOCK, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

(NOTE.—The marginal numerals following refer to the pages in the original record).

1 I am sixty-seven years of age; I came to Wichita in the winter of 1871 or the spring of 1872 and have lived here thirty-two years. I established the "Wichita Eagle" in 1872 and have been editor of it ever since. I have been acquainted with the Arkansas river since June, 1860, at which time I first saw
2 the river near where Hutchinson is now located and followed it up to the springs at its fountain head beyond where the city of Leadville is now located, and have been up and down it many times since.

The Arkansas river rises on the east side of the continental divide, near the Frying Pan, Tin Cup, Iowa gulch and Tennessee pass, in the State of Colorado, and flows south and southeast into the State of Kansas; it then flows through Kansas into Oklahoma, Indian Territory, and the State of Arkansas and empties into the Mississippi, flowing about two hundred and fifty or three hundred miles through the State of Kansas. The elevation at Wichita is about 1,326 feet, and at the west Kansas line about 3,600 feet. There are four streams in the State of Kansas which flow into the Arkansas river and have a natural, annual, and continuous flow. These
3 are the Little Arkansas at Wichita, Cow creek at Hutchinson, the Ninnescah, about twenty-five miles south of Wichita, and

the Walnut at Arkansas City. There are no streams above Hutchinson in the State of Kansas emptying into the Arkansas river that have a continuous flow. Three of the streams named flow into the Arkansas river from the north side and one from the south side. The Ninnescah is about one hundred or one hundred and twenty-
five miles long, flowing into the Arkansas river from the
4 south. When I struck the Arkansas river, first, on June 6,
1860, it was at the time of the great trans-Mississippi drought, the greatest ever known, when it didn't rain from September, 1859, to November, 1860. It was not a very large river. I at that time by digging down in the valley for water for myself and teams ascertained that there was an underflow that went east, to the river, and out of that came my hobby—and the Eagle was the first paper that advanced such a theory—that the agriculture of this valley was largely influenced by the underflow, and I called it "sub-irrigation." It is hard to say how much of a stream the Arkansas river was from the time I saw it in 1860 down to 1885. The Arkansas river rises in June or July and stays up until the June rise runs out. We call them "June rises." Then herds of Texas cattle would have to swim the river to get over to the other banks. We kept a ferry here in the early days instead of a bridge, and we thought the river had been navigable, and we nominated Tom Ryan, now First Assistant Secretary of the Interior, for Congress upon that issue. We got the appropriations from year to year until the stream commenced to play out from the ditches, and then I told Mr. Ryan to "cut it out." He went before the Committee on Rivers and Harbors, and they told him he probably knew more about that river than they did. They
thought they knew the most because the engineers and ex-
5 perts said it was navigable to Wichita. The ferry was here
before I came here in 1872. The first bridge was built across the Arkansas river at Wichita in 1872, and Complainant's Exhibit
A–1 (introduced in evidence) is a photograph of that first
6 bridge and is a correct picture of the same. This bridge was
located on Douglas avenue. It was about a thousand feet long, with eight or nine spans. This bridge stayed there five or six or seven years and the new bridge was built on the site of the old bridge.

I should say that Exhibit A–1 shows the river at the average
stage of the water. You see it is ten or twelve or fourteen
7 feet from that bridge down to the water, which was the aver-
age stage it used to be. Originally, the lightest flow of the Arkansas river was in the winter time, and the river would commence to shrink along in July or August, and would then remain practically stationary until the spring following, except occasional precipitations on the plains—cloud bursts, rain storms or something of that kind. The Arkansas river ordinarily commences to make a show with the spring rains in February and March, and generally reaches its highest state in the June rise, which is really about July, and the months of May, June and July may properly be called the

wet season of the year so far as the flow of the river is concerned,
and so far as the river is concerned the balance of the year
8 may be called the dry season. The picture shown as Exhibit
A–1 might have been taken as late as 1877 or 1878, and was published in a directory which I printed in the year 1878. This picture was taken from the south side of the bridge and from the east side of the river, the river flowing almost due south at the city of Wichita. Exhibit A–2 (introduced in evidence) is a picture of the new bridge, taken from the south side of the bridge and the west side of the river. This is the present bridge, and shows eight spans. As the
river kept dwindling away we kept taking spans out of the
9 original bridge, taking two from the east and one from the
west side, leaving five spans in the bridge now. I have caught fish where the Union mill stands now. Probably in the eighties I took up the question with the Secretary of War of the fact of ditches being built in Colorado and western Kansas, and of the fact that people here in the city were filling in our river, and I wanted to stop it, and it was my understanding that the Secretary of War controlled navigable rivers, and the Arkansas is a navigable river under the
law. His answer to me was that in the absence of some en-
10 abling act he could probably not do anything. Then I commenced the racket in the newspaper that brought about this contention here today.

Exhibit A–3 (introduced in evidence) is a picture of the bridge across the Arkansas river at Douglas avenue in the city of Wichita, taken from the south side of the bridge and east side of the river, showing the bridge with seven spans. This picture shows the river
a little low. The sand bar formed below the middle pier in-
11 dicates that the river was low; but I couldn't give the number of courses of stone in the abutments which would show when the river was low. During the seventies the average flow of the river during the dry season of the year was such that if a fellow didn't want to go across the bridge he could ford it, and he did. I would sometimes go down there with the teams for water and there would probably be three or four feet of water. It wouldn't run up to the bed of the wagon; and this would be something like the average flow of the water during the dry season of the year. For the last ten years during the dry season of the year there has sometimes been no flow at all. In 1891 or 1892 there was no flow of water above the mouth of the Little Arkansas at all, and the river
was perfectly dry. For the last four, five, six, or seven years
12 every once in a while in the summer time from the mouth of the Little river up there would be no flow at all in the main bed of the Arkansas river. The Little Arkansas river is a continuous stream that comes from other streams, and the Big river would be dry from here to Hutchinson, I think, certainly. In both the years 1901 and 1902 there was no water in the Arkansas river, I think I would be safe in saying, and I doubt if there was any in 1903. The average flow of the river during the dry season of the

year has been materially decreased since about the years 1885 to 1890, and the aggregate flow of the year round has been decreased. Of course we have had floods. We had one here the other day that spread over the town, which came from the Little Arkansas, and the Big river was up and choked the outflow
13 of the Little river. This last flood lacked about eighteen inches of being as high as the flood of 1877, when the river was two or three feet higher and went over our town. These two are the only floods that have been disastrous or very high. Every year, of course, comes the June rise, and that would affect the bottoms west of us here somewhat. I suppose the decrease in the average flow of the river during the dry season comes because the Colorado fellows have sequestered our water, and is because of irrigating ditches up the river. There is an underflow of waters from the base of the Rocky mountains to the Mississippi river. There is a river here a thousand feet deep under us—loose gravel and
14 sand. But what I mean by an underflow is that immediately under the surface, within eight or ten feet, anywhere in this valley, you strike water. This water has a perceptible flow. I originally discovered the underflow by digging a series of holes on different nights to get water for myself and the oxen. The dust would blow in, and one night I sprinkled some bran on the surface of the water and next morning when I got up it was on the south or southeast side of the hole. I called the attention of the Government man to it and he said he had found the same thing. This Government agent reports that the underflow was moving at the rate of eight or nine feet in twenty-four hours. The Arkansas river ordinarily rises in June, while the Ninnescah would rise the same time fifteen or twenty miles south, which rises out here on the plains, showing that there is a free circulation of the river
15 waters over into the Ninnescah. The direction of the underflow is generally southeasterly. If you spread something on the surface of the water in a hole you will find in the morning that the surface has moved with the direction of the river. If the overflow affects the Ninnescah, then it is twenty miles wide anyhow. My home is a mile and a half east of the Big river and the water comes into my cellar. During the flood of July 7, 1904, three of my
16 cellars had three or four feet of water in them, and when the river went down the water went out. If I had pumped the water out of my cellar it would have come in again as long as the river was up. This water did not come from the surface but from the seepage. When the river is full the water out in that valley is much nearer the surface than when the water in the river is low. After we lost our water in the river the farmers in what we call the bottom lands complained that their corn crops were not as strong as when we had more water in the Big river, because, as I say, this sub-irrigation, this water that came up near the surface,
17 benefited the corn.

Cross-examination.

By Mr. DAWSON:

537 I first saw the river in June, 1860. By meandering the river I mean that we followed it with our ox teams. I was not acting
538 in any official capacity or representing any government. We were out for a buffalo hunt, with the intention of winding up in the gold country. We came up the Neosha river and crossed the divide between the Neosha and the Little Arkansas, and I suppose struck the Big Arkansas about half way between Wichita and the city of Hutchinson. The Little Arkansas, as I remember it, was a delightful stream of clear running water. Compared with what we know of it to-day, it was probably low, but it had running water at that time, and I have never seen it since when it didn't have. That was a dry year, and there was no rain from September, 1859, to November, 1860. We kept on the banks of the river
539 and hunted buffalo. There were millions of buffalo then. And when we got on the south side of the river we would wade. I can't tell how deep it was, but we could ford it. It was at a pretty low stage compared with the river in later years. I left Council Grove or Emporia about the 11th of June, and probably struck the Arkansas about the 15th of June. We celebrated the Fourth of July where Pueblo now is, and the intervening time was consumed in going between the point where I struck the river and that place. When we got up the river a little way, somewhere probably toward Bent's old fort, the water was so low in the river that we dug holes to get water to drink; that
540 is, in the margin of the river we dug wells. In the vicinity of where Dodge City is now located, in the evening after a hot day there would be hardly any flow at all, and my impression is that from Dodge City up to Bent's old fort we didn't strike water of any amount. It seemed to come up in the night. And as we approached the mountains we found plenty of water. I think that in the region where Coolidge and Garden City are now located the river was especially dry, and we began to find some water
541 again at Bent's fort. Bent's old fort was located near the present town of Lamar. As we proceeded toward the mountains from Bent's old fort, we found the flow of water in the river increasing, and at Pueblo there was considerably more water in the river than at Bent's fort. The river was more particularly dry at that time from Fort Dodge to Fort Bent during the evening or afternoon of the day. The last buffalo we killed was away up beyond Great Bend probably twenty or thirty miles. There was some water there, because when the buffalo used to go over the bank it
542 was great sport for us to see them go into the water head over heels. At that time in the vicinity of Pueblo, Colorado, there
543 were evidences of a prior settlement of Mexicans or Mormons. When we got up to where the Fountain comes out of the mountains there was a little shanty town there—Colorado City. I

cannot recall whether or not there were any crops raised in that locality. From Colorado City we passed over into South Park, and from there onto the Arkansaw river at Iowa gulch, the first gulch this side of California gulch. At that time the mesas or plateaus looking out from the mountains this side of Leadville were heavily timbered, and from Leadville down on this side of the Arkansas river all those mesas were heavily timbered, and over on
544 Tennessee pass the same conditions existed. The forests were immense. I have been in that country since. The timber has been all cut off. I was there a year ago. On the first trip I did not go up the Arkansas river to where Canyon City is now located. We left the river at the present town of Pueblo. I don't know whether irrigation was being carried on at the point
545 where Canyon City is now located at that time. In going up the river we dug holes for water for ourselves and cattle through western Kansas and eastern Colorado. The water in the river was warm, and when we stopped to camp we would dig a hole, and then the water would be cooler. We did this several times. With our ox teams we would make only seven or eight miles a day. It was at this time that I formed a theory in regard to the underflow. One of the boys spilled some bran in one of the holes and it had gone to the other side of the hole, and I said "This is an underground river." The hole was sunk close to the river, in the sand. It was within such limits as would likely be covered by the
546 river waters when the river was high. We didn't notice this peculiarity of things moving on the surface at any other time on that trip. The hole that I have spoken of was located at some place between Dodge City and Bent's old fort, and the river at the point where this hole was sunk was running in an easterly or
547 southeasterly direction, and the bran moved in the same direction. I have no recollection as to the way the wind was blowing over the water at the particular time when this bran was in the hole. We didn't sink any holes out any distance from
548 the bank of the river. At places the river would almost disappear at night, and in the morning there would be quite a flow of water. We had only one shower on that trip. When we reached the mountains most of the snow had disappeared. The basin or drainage at the headwaters of the Arkansas river is
549 quite limited. The Arkansas river at Leadville is but a brook. The old Santa Fe trail crossed the river somewhere, I think, not very far beyond Bent's fort. There was considerable
550 water at the crossing. The bottom was hard. Between 1860 and 1870 I didn't have any particular familiarity with the Arkansas river. I located at Wichita in the winter of 1871–2. The first bridge was built after I came to Wichita. At that time
551 they forded the river. The ferry was just above. This was a Texas cattle shipping point. They generally crossed right below Douglas avenue. I would go down to the river in June and

July and see the cattle mixed up in the water, swimming
552 around and around. That is the only recollection I have of the water that summer. The first bridge was a toll bridge. I think the bridge stock paid some dividends. We consented that if they would not put more than fifteen cattle in a bunch they might cross the bridge. The large herds forded the river. The valley between the Cow Skin and Ninnescah commenced to settle up rapidly by 1872, and by 1873 pretty nearly every quarter section
553 was taken. During the fall and winter months a large part of the travel forded the river. My recollection is that the river ordinarily in the fall of the year was fordable, and especially for city teams or anything like that, along from knee deep to belly deep. That is the way it stood. It shrank more in the winter than at any other time. My recollection is that the old bridge had a stone abutment on this side, a big, heavy stone abutment, but what the distance was between the end of the street and the end of
554 the bridge I cannot recall. Not a very great distance, I think.

555 The second bridge was built about 1879. I don't know how long it was made. It seems to me it was about a thousand feet. It was a bridge of eight spans of one hundred feet each. After it was constructed two of the spans on the east side and one on the other side of the river were taken out, I think. The bridge was narrowed three hundred feet. At the time of building
556 the new bridge I was conducting a paper and had a good deal to say as to the wisdom of building a bridge long enough to take care of the water at high-water times. I have been protesting against the filling of this river for a good many years. It has been my judgment, and I have said through the paper, that the shortening up of the bridge and the narrowing of the channel was injuring the city. When the present bridge was built I had in mind the flood of 1877; that was the largest flood that ever came down the river at this point. It was greater than the flood
557 of this year. This last flood was more on account of the Little river than the Big river. The Douglas Avenue bridge in this city was built in 1879 or 1880 in reference to the flood of 1877. I would not like to say that it was built higher, because it is too uncertain in my mind. I suppose we discussed this thing, and my understanding is that the rule in building a bridge is to build it large enough—that is, high enough and long enough—to
558 take care of the high water. During the first ten or fifteen years after I came to Wichita the flow of water in the Big river was greater than it has been for the last ten years. In ordinary stages it does not come up as high on the piers of the bridge as formerly. The conclusion I draw is that the waters go out into the ditches of Colorado and only a small percentage of them return to the river. In 1860 when there were no ditches there was plenty of water at Pueblo and there was none at Dodge City; but that was an

exceptional year. We have not had such a year since. The
559 water was in the underflow and the underflow comes from that great distance. I know that more water falls in eastern Kansas up to the Flint hills than in this section of Kansas. There is more water here than at Dodge, and more at Dodge than at the State line, and in eastern Colo-
560 rado and western Kansas very little water falls at all. We get our supply for the water works at Wichita from an island in the river, where we go down thirty or forty feet with six-inch pipes and put a suction pump in, and we get Colorado water, without any question. The American Water Works Company, that new water works, made a certificate of the fact and told me that outside of the lime—minerals—in the water here we have as pure water as any city in the United States. Now, it could not be the seepage of these plains and be as pure as that. I distinguish the Kansas water from the Colorado water because our waters are harder than the Colorado waters, but it flows through five hundred miles of shale and sand, and that shale is rotten shells, and it is lime.
562 The water, of course, becomes impregnated with the lime. I don't mean that the water which we get in our wells is Colorado water; I mean the water in the water works wells is Colorado water. In sinking these pipes down, at the lower end of them the gravel is very scarce and there must be a free flow of water, because we have enough water over there on that little island to supply a million inhabitants; so there must be an immense underflow there, and I think it comes from Colorado rather than the drainage of Kansas because of its depth down there. I don't think it
563 draws its supply from the river. It is on an island, and I don't think if the river were dry it would affect the water works wells. Of course the river is all around and over it. If the river were dry there at the surface and for a hundred miles above to the gorge, not a drop of water coming through the gorge, we would still have ample water in the underflow. I think practically all the precipitation of these mountains on this eastern slope never reaches the plains on the surface at all; it goes down through those rocks. I don't think it is accumulated in the river above. You can go down there and put a well down twenty or thirty feet and
564 it goes into the air. Well, that is Rocky Mountain water. That is artesian water. The water at the water works is not artesian. These plains were once a lake, and its bed was sand and gravel, and the chances are that the water falling on the rocks in the mountains of Colorado gets down onto the old gravel bed of that lake and seeps clear through this country, clear to the Mississippi. We have sunk wells here one thousand feet deep and found the valley underlaid with sand all the way. I never saw anything else but sand and gravel. This last well sunk up here is about twelve or thirteen hundred feet, and I being editor of a paper, of course they would send me in every day some of the stuff they took out, a bottle at a time, and I don't remember getting anything up

near the packing house—it is two miles from the river—anything but gravel and sand—anything but coarse gravel. There is another river channel over here four or five miles, an old channel of the
565 river, and in my judgment the river may in different periods have run in different channels. I am told that when the June flood comes or formerly came in the Big river the waters in the bed of the Ninnescah would rise, and between the Ninnescah and the Big river, say at Hutchinson and along there, the hills are sandy; they are called sand hills; and I concluded years ago that the water was percolating away so freely that it only took three or four days after a big rise came before it got clear down through into that river.

As to the water conditions on the Platte river and from there
566 to the Red river on the south, as I have said before, that whole country was underlaid by sand and gravel, and that the Rocky Mountain water percolated all through that. Of course, now, there is a divide between here and the Kaw river, and a divide between the Republican and the Platte. There that might not hold true, but you take it from here to the Red river, two or three hundred miles, and it is all sandy formation. It was once a lake. Going now up to the Royal gorge, there is no soil; it is granite. It might pour down a ten-inch rainfall, and five minutes after it goes
567 down into these rocks and the water never appears again except as we catch it. My notion is that the rains which fall along the crest of the mountains sink into the ground without going to the river and proceed on their course with the pitch of the country, and that furnishes a great underground flow or sheet of water underlying this country. I don't know how much of a sheet it is, but I can't account for this great body of water underlying this land in any other way. The little body of water coming out of the gorge—it doesn't come out of that. That country from here to the Rocky mountains is a great inclined plane, falling seven or eight feet to the mile. Now, on the base of that inclined plane the substratum or what it is made up of is all sand and gravel. If water is poured in up at the upper end, why would it not come down
568 this way? It does.

The width of the valley here varies. Eighteen or twenty miles above it will be twenty miles wide; at this point it is only about five miles wide. It varies. And from the information I have gathered I am inclined to think that this valley of about five miles in width is practically filled something like one thousand feet deep. I don't know how fast this water under the surface moves. I was told the other day by the United States expert that he thought it went only about nine feet in twenty-four hours; but I scouted that idea. I can't see how a country could fall eight feet to the mile and the water not flow faster than that through this gravel and sand. I have never made any tests myself. When I speak of the
569 Royal gorge I mean the Grand cañon of the Arkansas above Canyon City. I have been through there many times and know that it is narrow and right straight up on the sides, and that

it is granite, and through that gorge flows the channel of the Arkansas. My recollection is that the gorge at the bridge is about twenty-five to thirty feet wide, and the walls there are about one or two thousand feet high. So impressed have I been for years about this underflow business and sub-irrigation that I gave this locality the name of "The Nile of America." It is like the Nile in many respects. I was about the first person to publicly commence agitation on this subject of the depletion of the waters of the Arkansas river by the people of Colorado and partly by the Kansas fellows too. I appealed to the Secretary of War or brought the fact
570 to his attention that in my judgment the lands that the Government had sold to the settlers of this country were being deteriorated and were losing in value because you fellows out there in Colorado and western Kanwas were digging ditches and taking the water away. I think that was in the early eighties. I think it was about fifteen or eighteen years ago that I took it up in my newspaper, and I kept whacking it along pretty nearly every
571 week. I knew if something could not be done by the Interior Department or some authority, if it ever reached the Supreme Court it would stump the Supreme Court or anybody else. This question of Colorado and the Rio Grande river in New Mexico, it would be like a fellow going up the Nile and going into irrigation up there. It could destroy all Egypt. But it seems to me the Supreme Court is up against one of the biggest questions that ever confronted it, because in this case they will have to decide the whole irrigation question, which is becoming a national question, affecting a dozen or fifteen States and Territories. I cannot say how early I noticed that the water in the river commenced falling off. It seems to me it was fifteen or eighteen years ago. It was when Senator Plum was Senator. He had an interest in a ditch out here, and
572 of course he didn't urge the Secretary of War to do very much. I think this ditch was near Garden City, Kansas, that Senator Plum was interested in. I have never had any money interest in any ditch. My paper stood for Kansas and the development of the whole country, but when it came to a ditch question, I was afraid of it. I probably discussed the construction of ditches in western Kansas in my paper, but I never thought whatever they might do with those ditches would affect us any. The first time I had any apprehension about the ditch business was this
573 twenty-mile ditch near Garden City in which Senator Plum was interested. There was an effort made, I think, about this time to run in on a grade and catch the underflow in one ditch and conduct it out to the surface for irrigating purposes. My boy was in Congress and he had a scheme with some fellows. He had no moneyed interest, simply a political interest. I was one of the fellows that started the appropriations for the Arkansas river, and we built boats out here. Senator Plum and myself and one or two other fellows got up a scheme of running a fellow for Congress
574 from Topeka for this district down here, a gerrymandered district, that I got through the State Senate myself, to get the

support of the people down here for the fellows up there. The advocacy of the navigability of the Arkansas caught them. The freight rate schedules of the railroads at the present time are all based upon navigable waters. The running of steam boats up and down the river would give water rates for our wholesalers. Of course the engineers sent out here were told to keep in touch with me, because at that time I was quite a fellow here. One of these engineers assured me that there could be a channel put through from here down to Arkansas city sufficient for navigation with little boats. They built their boats here at Sankey's on the channel. A fellow
575 by the name of Walton built a flat-boat at Arkansas City and put a saw mill engine on it and some kind of a wheel and started for Wichita. He got here within ten or twelve miles and went back. That must have been in 1870. They built a number of boats here in the early days to haul lumber down to Arkansas City. This was at the end of the railroad. There was no other road in this city. The Santa Fe came here and stopped. I didn't pay much attention to it, but I know they built some boats here, little flat-boats that came from Colorado down. They never carrid on any commerce further than that. I don't know but there was some
576 flour or something shipped down in the river flats. No boat ever got back that went down. They didn't go with that idea. The river was not navigable for any practical purpose after you folks commenced taking the water, and before that it was not, in my honest judgment, navigable for any practical purpose. Grant once said when he was lieutenant in the army that the Arkansas river would be navigable from this city to its mouth if they would copper-line it, and I guess he was about right, because I know how shifting those sands are. According to my theory the injury to the farmers occurred in this way: All the water being underflow water, the higher the underflow was the nearer it would go to the roots of the corn. In other words, when this river was bank full the year round there was five or eight miles of valley here that raised great crops
577 of anything whether we ever had rain or not. I contend that the surface of this ground water has fallen off by reason of the depletion of the water in the river in Colorado. I have found that out in a good many ways—by the sewers constructed in this city, by a sink that I dug in 1872 or 1873. I could only dig a cellar under my home three or four feet on account of running into
578 water. This cellar that I have spoken of was in the northern part of the city, probably a mile east of the Big river. I still have that place, and the cellar is deeper and the water doesn't come into it now. This cellar is about four feet underground; the first one was about three feet. When I got down to water I had to quit. I put in my foundation where it was pretty damp; so that there is at least a difference of a foot in the distance you could go down in these two places. In a year or two I had to clean out that sink
579 and I had to go a good deal deeper to get water—I think three or four feet. It was just a kitchen sink for the women

to get rid of their extra water. My notion as to the difference in the level of the surface water in the last ten years as compared with the first fifteen years is that the volume of water that comes down the river on an average is not over one half of what it was fifteen or twenty years ago. As to the surface of the water in the river during ordinary seasons, I suppose it is lower, but there is the matter of the filling in of sand; as the waters of the river have been decreased the bed of the river has come up—filled in. Several years ago I made an effort to have the farmers in the valley organize to see what rights they had. It was suggested to me that the thing to do was to get out and see some of the farmers and organize so as to see what rights they had. That was about two years ago. There had been considerable discussion both oral and through the paper for years before that about this matter. I know that the farmers made contributions, but I believe the commissioners made appropriations too, but I wouldn't be certain,—the commissioners in two or three counties here. I don't know whether or not we got appropriations out of any of the other counties. I know that there are windmills and wells in western Kansas. About Dodge City, Garden City and that country there are such wells being pumped constantly for cattle. I know that the pumps cut very little figure when it comes to irrigation. The strongest pump and the biggest windmill you can put up will not irrigate more than an acre or two. It would not decrease any underflow.

I never attended as delegate of any kind any meetings of irrigation congresses held in this or Western States. I was appointed a delegate once or twice. But I never went. I never go to public meetings of any kind. One of these irrigation meetings or congresses was held in this city and their proceedings were reported in the papers in full from day to day. I don't know when this was. It has only been four or five or six years since we had a meeting of that kind. During these irrigation congresses what was being done in Colorado as well as in Utah and other States was quite fully set forth at their meetings. I didn't hear the discussions. The lands in this valley in the vicinity of Wichita have not lost in productiveness except as they have been deprived of water. The corn crop here is not as sure a crop as it was fifteen years ago, for the reason that the water does not come up as near the surface as it did then. This year we have had one or two pretty good floods of water here, I think, but it was not from Colorado; it was from western Kansas. They had very heavy rains out there this spring, all over this western country. Statistics will show that the average corn crop for the last five or six years in the Arkansas valley has not been equalled by those of twelve or fifteen years ago. I can't say whether the corn crop has shown a falling off in the particular years when the river was low, but the corn crops in the Arkansas valley have not been satisfactory.

588 When I first came to this country it was mostly an unbroken prairie. There was not much if any timber in the country except the little strips along the water edge. The face of the country is entirely changed. The planting of groves—most every farmer has his little grove and orchard and everything of that kind, and it has completely changed the face of the country. Go out on this hill and look over this valley for twenty miles and you would think it was half timber: of course it is not. A
589 great deal of sod land has been broken; I guess two thirds of our country is under the plow. The growing of this timber and the increase of plowed land has a large climatic effect. Formerly the rains came in hard floods on dry land and ran off into the stream because it would not readily sink into the ground. I don't think there has been much change in the precipitation. When it falls on plowed ground it goes off very slowly and makes a more humid atmosphere and is better for crops. We have fogs now where we formerly had no fogs at all. The percentage of water out of any given fall that would run off into the river now would be
590 less than formerly. If it should appear from statistics that the falling off of the corn crop in the counties along the Solomon, Republican and Smoky Hill country had about corresponded with that in the Arkansas valley in the same period of years, this might tend to change my notion as to what causes the falling off in this locality. Northern Kansas has worried me, and of course I stand for southern Kansas; but their corn yield during the last seven or eight years has been phenomenal; and in southern Nebraska the same way. Those are not streams from which there is any amount of irrigation; I don't think there is any at all. The lands are worth as much in the Arkansas valley today as they ever were, on an average, but probably would not
591 sell for quite as much, that is, except during our boom times. But aside from boom times they are worth as much as ever. A good many of our land owners feel that their lands are being deteriorated in price or value, or will be, because their crops do not come up to what they did formerly, which they attribute to the loss of the underflow of the water. Of course values here are growing, because we are a growing community.

592 Cross-examination.

By Mr. ROGERS:

My paper, the Wichita Eagle, has been the vehicle, of course, for keeping this thing before the people to some extent, more than any other paper. There is no claim that the health of this neighborhood or upon the lands along the river was being injured by
593 reason of this diversion of water in Colorado. I can't see why it should touch the health of the people. I have not looked into the matter to see whether the assessed value of lands and the amount of taxes paid on account of these lands has de-

clined. All the arable lands of southern and western Kansas are increasing in value because of their wheat producing qualities, and of course as they increase in value they are taxed higher. As far as that is concerned, we have not lost anything. My con-
594 tention—I said to those people who owned their lands, who bought their farms from the Government, with the river there, and the supposition, of course, that it would always be there, "You are going to lose your river and the value of your lands will deteriorate." Now, that is the kind of argument I make.

This suit was authorized by the legislature, I think, by reason of the action of the people in Cowley, Sumner, Sedgwick and Reno counties acting in concert. We had to convince our own legislature that we were being damaged by the loss of water. I don't
595 expect that the counties of Hamilton, Kearney, Finney, Gray, Ford, or Edwards take an interest in having this action instituted. I don't know. They wanted to profit by Colorado's example, I reckon. They were in fact taking out the water from the river themselves to some extent. My first complaint was against the western people of Kansas and not against Colorado.

Q. What the people here desire is not only to establish a rule as against the people of Colorado appropriating water but also against the people in western Kansas who appropriate water? (Objection.)

A. The people here desire—being afraid they would be robbed of the river entirely—a decision from the Supreme Court to the effect that the Arkansas river shall not be appropriated in whole, either in Kansas or Colorado or by anybody else.

596 Our fight was against the other fellow not against the Kansas fellow particularly, because the irrigation enterprises of western Kansas have never amounted to much, and we had no particular fear of western Kansas. It was the big corporation ditches of Colorado that convinced us that in a little while we should have no water at all, and the bed would be filled with shifting sands. I don't distinguish between present irrigation enterprises in western Kansas and present irrigation enterprises in Colorado ex-
597 cept as Colorado enterprises are greater than in Kansas. I am not in favor of cutting out the Colorado people and allowing western Kansas to appropriate the water. I am not in favor of anybody destroying the river. My contention really was and this scheme was, of course, sub-irrigation and navigability of the river and sewerage for the cities along its course. The object of
598 this suit is to save the river for the people who settled along it.

Q. That is, on this part of the river, you mean? (Objection.)

A. Well, self preservation is the first law of life. Of course we are for ourselves first.

We are perfectly willing that the people of western Kansas and Colorado shall have the use of the river the same as we have or for the same purposes. This excludes their use of the river for irrigation. (Objection).

599 Victor Murdock is my son. He is a candidate for Congress. He is before the public now. He has been in Congress only one term and has been looking up the subject of irrigation quite extensively, and he is, I believe,—I am not certain,—at least he is going to advocate or does advocate the idea of reservoir storage for irrigation purposes. I never heard him say anything about the Arkansas river one way or another.

Q. I notice in the Eagle of August 18, 1904, that it is reported that at Garden City he said that "I am going to give you
600 irrigation." Now, does that mean anything but irrigation from the waters of the Arkansas river. (Objection.)

A. Well, I don't know.

601 I don't know specifically or exactly of an association that has been formed for the purpose of promoting, encouraging and aiding irrigation works in Kansas utilizing waters from the Arkansas river, either the upper flow or the underflow at
602 Garden City. I don't recall having noticed their proceedings in the Wichita Eagle. I don't know whether the Kansas statutes since 1886 authorize the taking of water in
603 western Kansas exactly as it has been done in Colorado. (Objection.)

You can determine what the crops amounted to for the different years by the agricultural reports; that would be my
604 only way of getting at it. I mean to say that if we find from the returns there was a large crop in any given year that that meant that that was not a year of drought; in other words, that the climatic conditions that year were all right. The small ditches in Colorado didn't take enough water to make it perceptible to us; we didn't know that we were losing water. I didn't make any
605 claim as to those ditches. I don't remember any complaint being made against Colorado or its ranchmen up there previous to the time of the digging of the big ditches or previous to the time our water flow was affected. Logically, we can take it from that that prior to that time these lands were not materially affected. Of course I don't know; it is a mere matter of opinion.

Q. I want to get at how far it is thought necessary to obtain relief against ditches in Colorado, and I want to know from your knowledge of the views of the people concerned in this suit,
606 that is, those who have lands that have been affected, whether this is a correct statement of their position. It is a statement made by Senator Frederick Dumont Smith at Garden City on April 16th and 17th before the Western Kansas Irrigation Association. He said: "The suit of the State of Kansas against the State of Colorado is a bill in equity for a permanent injunction against Colorado restraining that State from granting any more charters or other rights to take water out of the Arkansas river. The suit will not affect any ditch now existing or appropriation of water now effected or water rights now vested. It will not affect the rights of any riparian owner. It is to prevent the taking of water

from now on, not for riparian lands but for lands back on the upland, wholly non-riparian in character and many miles from the river, depriving true riparian owners in Kansas of the water to which they are entitled for the benefit of non-riparian owners
607 in Colorado. This is the whole gist of the suit." Is that the understanding here? (Objection.)

A. I would like to make a double answer to that if it is permissible. I am referred to for my knowledge or conclusion. Individually, I expected if we gained the suit it would be to the extent of stopping further ditch digging, but unquestionably the great majority of the land owners here who have been complaining and who are back of this complaint want Colorado estopped not only from digging ditches but to dry up the ditches she has already dug, that is, the corporation ditches. I don't think a Kansas man or farmer would have any objection or raise any objection to any individual owner of a ditch in Colorado or any place else.

Examination by Mr. A. C. CAMPBELL:

608 At the time I took the trip on the Arkansas river in 1860 I didn't go to the Tennessee pass in Colorado, but I was all around on the tributary streams around Leadville and California gulch that make the Arkansas river. From Salida or at least to Twin Lakes the banks of the stream were heavily timbered, and from Twin Lakes to Tennessee pass. Twin Lakes is above Salida fifteen or sixteen miles, below the mouth of California gulch. It is very heavily timbered from Salida to Leadville, on the west side
609 of the pass. The fact is that it was very heavily timbered on both sides of the stream when I first went there in 1860. The last time I was on the Arkanses river in Colorado was in September or October, 1903. At that time the land surrounding the streams was entirely denuded of its timber, that is, all the merchantable timber, the big trees, were all gone. Of course there is some little brush around there. I have made some examination in respect to the Ohio river as to the effect of cutting timber from along its banks, and the effect is that the rains are simply precipi-
610 tated into the channels of the river much more rapidly than when there is timber. The water from the snows in the timber melt more slowly than where it is open. I don't know whether the cutting of the timber from the head waters of the Arkansas river in Colorado has had any effect upon the flow of the river in the dry seasons here in Kansas. I never gave it any thought.

611 Redirect examination.

By Mr. ASHBAUGH:

It was an exceptionally dry year from 1859 to 1860. There were a number of boats came down the river from above, and a number of them were moored here at our bridge; you would call them

house boats, I reckon; and I think there were at least two boats built here, pretty good size boats, thirty or forty or fifty feet long and ten or fifteen feet wide, to go down the river.

612 The Government engineers cleared out some snags and obstructions in the river here and built some jetties out of willows to force the water into the channel. They did that successfully after awhile. They were regular army engineers and were here carrying out the appropriations that were made. It is my recollection that flour and lumber were shipped down the river.

613 The Solomon and Republican valleys are great corn valleys.

18 OLIVER MULVEY, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I am sixty-seven years old, now live in the State of Arkansas, and lived in the city of Wichita, Kansas, from the spring of 1879 until the year 1900. I am a civil engineer by profession, taking my degree in 1859 at Hanover, Indiana, and followed my profession as civil engineer nearly all of the time when I was living in the
19 city of Wichita. I am well acquainted with the Arkansas river and the location of the city of Wichita. I was city engineer of the city of Wichita for five years, and the first sewer system was put in the city under my direction and some sixty miles of sewer pipe were put in. The plans were made by myself, and we made a topographical survey of the surface of the ground and also of the surface of the water underneath for the purpose of keeping our sewers out of the water so as to reduce expenses.

20 I never saw the old bridge shown in Exhibit A–1. When I came here in the spring of 1879 they were building the present iron bridge shown in Exhibit A–2, which bridge was completed in the year 1879. It had eight spans of one hundred feet each. Exhibit A–3 is a photograph of the same bridge,
21 showing seven spans. The first span was taken out of the west end of the bridge about the year 1888, I presume to accommodate some of those people on the west side that wanted some more land. I don't know. The third span was not taken
22 out before I left Wichita in 1900. The second span had been taken out before I left the city in 1900, and had been taken out between the year 1890 and the year 1900. The water as shown in the river in Exhibit A–3 I would call low. There are six tiers of stone shown in the abutment. The abutment stands probably fourteen to sixteen inches out of the water. The base of the abutment—of the stone work—stands up about that much out of the surface of the water and is supported by grillage which rests on wooden piling. The piling shows above the water this 15th day of August, 1904. Piling above the water will decay and must either

be cut off, and replaced by material that will not decay or
23 these piers will come down. I should say that the average flow of the river during the dry season of the year for the first ten years that I knew the river was as much or more than is shown in Exhibit A–3. During the dry season of the year at that time in very dry seasons we could see some of those sand-bars. The average flow of the river for the nine months known as the dry season of the year I should say was perhaps a little above that. Not very much. During the first ten or fifteen years after I came here I never saw the river so low as to show the piling under the stone abutments. The water as shown in Exhibit A–3 is perhaps as low as it would be shown on the average during that fifteen years at the lowest. I do not recollect when I saw the grillage first. The grillage is the wood that rests on the top of the piling. I had been told that the stone piers rested upon piling and grillage, and I had taken an interest in looking for that, trying to see it, during the different low waters, and it was some years before I ever saw any of it. I took an interest in that every time I crossed
24 that river, to look and see whether I could see the bottom of the stone work, to see whether I could see any of that woodwork appearing. I saw a little of the woodwork underneath the stone piers, perhaps ten years ago. Among the first years I couldn't see that, although I was really looking for it. Today you can see fourteen to sixteen inches of that wood work. The level of the water when Exhibit A–3 was taken was twenty-four to thirty inches higher. I think that the average flow of the river during the dry season of the year during the last ten years has decreased in comparison with the average flow of the river during the first ten
25 years that I knew it. In digging the ditches for our sewers we came across the underflow in a number of places; that is, came across the water in the ditches—found the water in the ditches. It interfered somewhat with our work, and was flowing in the general direction of south or southeast. The water under the city of Wichita has a decided flow southeast and extends all the way between these river markings—the College hill or the east, perhaps two miles, to the bridge west of the present river—some six miles wide. The flow in all parts of the valley is presumably about the same. At the corner of Topeka and Williams streets, near the opera house, you would strike water in about three or three
26 and a half feet. It is a low point. The sewers in this city were commenced in 1888. We performed a number of experiments by boring a lot of test holes at that time and went down to the damp clay to find the height of the water and by that means constructed the surface lines of the water over the city where our test holes were bored. This was for the purpose of trying to keep our sewers out of the water. My observations extended four or five miles up the river.

27 The Little Arkansas river empties into the Big Arkansas near Central avenue the fourth street north of Douglas avenue

in the city of Wichita. I think the average flow of the river during the dry season of the year above the mouth of the Little river has decreased within the last ten or fifteen years in comparison to what it was when I knew it first. I don't know that the decrease in the flow of the river has any effect upon the underflow except as to its rapidity. I believe it would decrease the rapidity of flow. The decrease in the flow of the river has lowered the surface of the underflow—the upper surface of the underflow. The underflow has lowered in proportion to the surface—to the lowering of the surface of the visible river. There is a point there that I would like to make, that
28 as the surface of the river lowers down the surface of this water underneath would have a tendency to slope toward the visible river. If it was a rising river the slope of the under water would have a tendency to be in the other direction from the visible river, the visible river then being the highest. I call it a river underneath here; that is the reason I speak of the visible river and the river that is underneath. This is a mere theory or belief or judgment. If the water is flowing through those sands in the general direction of the river it would be natural to suppose that it would flow towards the surface of the visible river if that were lower than the surface of the water down in the sand; that flowing through the sands being of less velocity than that in the visible river, naturally it would flow in that direction somewhat and parallel with the river.

29 Cross-examination.

By Mr. HAYT:

I have used the words "mere theory" as applied to the slope of the surface of the underflow towards the river whether it was higher or lower than the surface of the river. When the river is high, rapidly rising, I would say there might be a slight flow toward the river markings,—the river banks—if you saw fit to call them so. If the river was falling then the slope might be the other way. At the city of Wichita I think this underflow extends about six miles in width, about two miles on the east side and about four
30 miles on the west side, and as far north as the sands exist beneath the surface along the valley of the Arkansas. I don't think there is any at Pueblo where we have a rock bottom. In my judgment, it commences this side of Pueblo in the State of Colorado, and the water is supplied from the river itself. I base my opinion on the numerous drive wells that have been used in this section of the country. Undoubtedly a portion of this water comes from the general drainage of the country independently of the river. All this surface that catches water around here drains into this river and goes to supply the river and the river makes all the underflow. The Arkansas river permeates the sands underneath here and makes the underflow. I think the greater portion of it comes that way and my judgment is that it comes from the

drainage from the mountains. It may be that this water comes
31 directly through the soil—the seams in the rocks—to supply this underflow without reaching the river, but I don't think it does. Where the drainage to the river extends fifty or a hun-
32 dred miles laterally from the channel of the river the underflow may extend as far as those sands extend, continuously, from the sands of the Arkansas river. I have made some investigations to determine the velocity of the underflow. We saw that in digging our ditches for the sewers. Little bubbles on the surface or chips would fall in below. In my judgment this underflow has a velocity of one to two feet per minute, or from sixty to one hundred and twenty feet per hour, and of course in twenty-four hours it
33 would be twenty-four times that amount or possibly twenty-five times—the number of feet per hour. If investigations should show that this water was moving at the rate of only nine or ten feet each twenty-four hours, that would not cause me to change my opinion in reference to the velocity of the underflow at this point. My investigation as to the underflow has been confined entirely to the city of Wichita and vicinity. The rapidity of the underflow in the sand may not be so great as where I observed it in the open ditches. It would accumulate from all sides, and the water in the ditches would flow perhaps more rapidly in those ditches than it would in the sand where I couldn't see it. When I speak of the velocity of the underflow I refer to the flow in the ditches after the trenches were dug, as I observed it in those trenches. The fall of the river at this point is about four feet to the mile. By straightening our lines we got five and a quarter feet to the mile fall
34 in our sewer.

Complainant's Exhibit A–3 was taken after the year 1888. At the time it was taken one span of the bridge had been removed, and since it was taken two more spans have been removed and the ground filled in on either side of the river, near the bridge, on the west side so that they have taken out fully that one span that was removed and on the east side the two spans, and the channel of the river has been narrowed up to that extent. I think this would cause the river to scour out and lower the bottom of the river channel. The fact that the bottom of the river has been lowered from twenty-four to thirty inches, caused by the scouring out of the river, might have the effect of lowering the water in the river; but that would not necessarily lower the surface unless it would lower farther down. It would simply make a deep hole like the old swimming hole and the general level of the surface would be the same. I think if the bed of the river was narrowed up and the banks brought in the tendency would be to scour the bottom of the river out deeper. This would undoubtedly be the general tendency. At the bridge the stream has been narrowed about three hundred feet.

When I say that the average flow of the river has been less for
36 the last ten or fifteen years than before that time, I speak merely with reference to my general recollection and not with

37 reference to any particular examination, except my observations, which were of a general character, and these extended from 1879 to 1900. I think with these casual observations I can testify with some degree of certainty at this time. A person of observation, as I have generally been throughout my life, would notice things of that kind. If I had known that I would have ever been called upon to testify in reference to the flow of the river I
38 would have made careful observations, and I would deem such careful observations necessary to give accurate testimony in regard to the flow of the river. I didn't attempt to make such observations. In the year 1888 we had a bench mark—a surveyor's bench mark—on the top of one of those piers for the purpose of getting elevations, and we measured from the surface of the water up to the top of one of those piers. I made several measure-
40 ments at that time from the water up. I never made any measurements to determine the average height of the underflow—the average water level of the country—except during the years we were making those measurements for the sewers. It was simply one set of measurements from the south to the north. I made the measurements under the foundations of this Federal building in 1888. I found the water level at that time about a foot below the surface of the cellar; it was then dug out. The bottom of that cellar is perhaps five feet below the surface of the ground—I
41 mean the general, the old original surface. It has been filled in around the building some since, and it might be six and a half to seven feet below the surface of the ground now. I am only giving a rough judgment as to that. I would say that the water level in 1888 was about eight and a half feet below the present surface of the street—possibly less than that. I would say not to exceed five or five and a half feet and about seven feet below the surface of the ground adjacent to the building. I would say
42 about eight feet, in 1888.

Cross-examination continued.

By Mr. ROGERS:

The sewer system extends over an area of five or six square miles, and the system from north to south is about five miles long.
43 The drainage is to the south or southeast. Commencing at the upper end, we started with a depth below the surface of about nine feet and ended with a depth below the surface of four or five feet at the lower end, and the fall is about five and a quarter feet to the mile, and the fall of the country is about the
44 same—perhaps a little more. There was a difference in the water table at the various points at which I made measurements, but I don't know how much difference. It showed distinctly on the profile maps that there was a decided flow or slope to the water table—a slope from north to south. We didn't make the test holes from east to west, we took them in a general line of north and south

nearly, and I don't know whether, extending latterly from the river, the water table at any distance from the river is higher or
45 lower than it is near the surface. I didn't find the direction of the underflow in the test holes; I simply found the surface of the water below the level of the ground. I found the direction of the underflow in the open ditches.

46 I have made investigations or observations of the river as to the increase or decrease of its flow at points other than the Douglas Avenue bridge—at Swan's island, about four or five miles above, where I made a survey for the Government of an island in the river. This was in 1887—perhaps in 1886. I was there
47 for two or three days. You might say that aside from the observations made at the Douglas Avenue bridge the observations at this island are the only observations made by me of the flow of water in the Arkansas river, although I have observed it at other points.

I have also observed the Little Arkansas river. It does appear to me there has been a decrease in it, but I don't think there
48 has been the same decrease in the Little Arkansas river that there has been in the Arkansas. The big stream is sometimes dry, as I have observed, but the Little river I never saw dry. I think the volume of water in the Little river has decreased some, but not very materially. I have had no occasion to measure it. I am not positive on that point. I have frequently seen years
49 when the Big river didn't go dry during the year. I have been up in Colorado as far as Buena Vista, not quite to Leadville. I have never been at the fountain head of the Arkansas river. I would think that the underflow is formed this side of Pueblo, but that is all I could state in a general way. It sinks into the sands wherever the sands occur underneath the river, and flows with it.

49 Examination by Mr. A. C. CAMPBELL:

The underflow I speak of is found on both sides of the river and underneath the bottom of the river. I have found this under-
50 flow above the level of the bottom of the river, on a level with the river. You might find it above the level of the surface of the river when the same is rapidly falling.

Redirect examination.

By Mr. ASHBAUGH:

During the years I lived in the city of Wichita I had an opportunity to observe the flow of the river and did observe the flow of the river, and have testified from these general observations. The difference between underflow and sheet water is that sheet water may be standing still and an underflow would be flowing, if I understand your question. The ditches that I spoke of where the flow was perceptible were ditches that were closed at the lower end—closed as they were built, as we were building up from the low point to the high point.

52 JOHN W. HARRISON, Colwich, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived near Colwich, in the northwest part of Sedgwick county, Kansas, continuously since 1871. I and my boys together own about fifteen hundred acres of land and at the present time have about a mile of Arkansas River front on the south side
53 of the river. As a farmer and stockman I have been pretty well acquainted with the river for thirty odd years. The land near my place, or about a mile and a quarter wide next to the river, we call first bottom, and about ten or fifteen feet above that, back from the river, we call second bottom. In this country there are practically three descriptions of land—first bottom, second
54 bottom and highlands. About one half of my land is first bottom land. We raise on the first bottoms corn, wheat, potatoes, cabbage, fruit, and orchard fruits, and on the second bottoms we raise wheat principally. We don't raise corn on the second bottoms because we don't consider it a certain crop as we don't get the proper amount of rain to insure a corn crop. I have been acquainted with the Arkansas river for the first fifteen years after I came here and with the flow during the dry season of the year for the last ten years. The average flow of the Arkansas river during the dry season of the year has decreased since the year 1885 to the extent of from two to five feet. Along through the months of June and July the snow used to melt up in the mountains and we got a full flow of water in the river, and we depend on that in the bottoms carrying us over the dry season just when our corn was maturing on the bottoms. It just came in at the right season to mature our crop and we always looked for plenty of rainfall, when we got the full flow of the water, when they had plenty of snow in the mountains,
55 and we got this sub-irrigation which would rise up all along the road until it was quite moist. When you get up on the upland the road is dusty. The sub-irrigation rises and falls with the flow of the river. When the river is comparatively dry we don't see but very little of the sub-irrigation. We noticed the sub-irrigation plainly by cultivating, or pulling up weeds. We would see the moist dirt sticking to the weeds when we pulled them up in the corn field and when we are plowing. The sub-irrigation or underflow has a noticeable current from the northwest to the southeast. I don't think that my bottom lands along the river
56 and others similarly situated are as valuable and productive now as they would have been if the river had remained as it was during the first fifteen years that I lived there. They are not as productive as they were during the first fifteen years that I lived there. We are not so certain of a crop as we were, more especially as to corn and potatoes and crops of that kind. The fall of the water in the river has affected the corn crop in two ways—we

don't get this sub-irrigation as we did, and we don't get the amount of rainfall that we did. This sub-irrigation has been reduced and the level of it has gone down from two to five feet, and the fact of its having gone down has affected the productiveness of our
57 soil. The lowering of the water in the river has been caused by the irrigation ditches in Colorado. Our orchards have been affected by this changed condition in the flow of the river in proportion to our corn and potato crops, and this condition extends on both sides of my land, and on both sides of the river. I have travelled over a good part of the country and have noticed it from year to year and have talked with a good many men on this subject. The lowering of the water in the river has also affected the crops on the second bottom by reducing the rainfall by not
58 having the flood in the river. The river is not as wide between the banks now as it was during the first fifteen years I lived here. Just north of my house, on section 35, township 25, range 2 west, within the last twelve years the river has narrowed up 627 feet. The river has been narrowed because of the water being abstracted and not getting the natural flow. This is a natural narrowing up from start to finish, I think, and has not been filled in by the people along the banks. The river has narrowed up on one side and then on the other side it will narrow up again, which makes a continual narrowing up of the river. This condition exists for several miles up and down the river. Within the last five years
59 the river has narrowed up 287 feet by actual measurement. During the first fifteen years that I lived there it didn't narrow any that I ever noticed. In regard to the average flow of the river during the dry season during the first fifteen years, there was one year out of that fifteen that they didn't have any snow in the mountains, as I am told, and the river went almost dry, but the balance of the time I didn't know what it was to have a corn failure. That was in 1874. We had a nice flow of water you might say almost all of the time, with that exception. By "a nice flow of water" I mean the river ran
60 on an average from a foot to six feet deep and five or six hundred feet wide, and from bank to bank. That was the condition for the first fifteen years. I noticed the water began to go down immediately after those irrigating ditches were put in there. Why, we began to notice it, and as the irrigating ditches—we would get reports that the irrigating ditches increased, why, our water decreased. During the last ten years the average flow—the river has been dry—comparatively dry. Of course there would be a little rivulet, perhaps, running along. At sometimes we could step over and sometimes jump over and sometimes we would have to wade, and there would be some running water the bigger part of the season, yet there were times all along when it was comparatively
61 dry. These places where there was some water during the last ten years would sometimes be from ten to a hundred feet, and in the high time up to five hundred feet wide. When the water

was from ten to fifty feet wide it would run from six inches to two feet deep. This falling off has, I think, decreased the productiveness of the soil. I have made complaint to the Government about this. About four years ago they said there was a cloudburst in Colorado and the river came down here bank full and it took that underflow about a day and a half to get out to my open well where I lived, three-quarters of a mile from the river. I could see it bubble up through the ground. The banks of the river were full of water, and in about a day and a half I could begin to notice that un-
62 derflow worked out three-quarters of a mile from the river in the well and through the low places in the field. It rose about five feet higher than it was, and as far as I could tell was just about the same gauge with the river. The underflow certainly does rise and fall with the flow of the river. I have a cellar and you put a light object in the north corner of the cellar and leave it there over night and in the morning it will be in the southeast corner. That shows that there is a current of the underflow going in that direction. The water is in my cellar just when the river is high. We call June and July the wet season of the year if they have plenty of snow in the mountains. This water got into my cellar
63 through the sand underneath and was entirely seepage and didn't run in from the surface. I keep my cellar banked up around to run the surface water off, and it is but very little affected by a local shower. The underflow is but very little affected by a local shower. The underflow is affected by the flow of the river coming down from the mountains, and of course if there are local showers and the river rises it has this same effect.

Cross-examination.

By Mr. DAWSON:

I have been engaged in farming at least a part of these lands I now occupy since 1871. I grew wheat upon the first bottom lands from 1882 up to the present; that is, we changed it from corn to wheat and corn to oats, and hogged our corn down; but prior to
64 1882 I kept the land mostly in corn and oats, and for the last ten years in a variety of crops—alfalfa, corn,—it is about five feet down to the water on my lands. I don't know how far the corn extends its roots into the soil. I am satisfied the corn roots
65 go down a great deal deeper than eight inches. I don't know how far wheat extends its roots into the soil. They claim that alfalfa digs deep into the ground after water. Water doesn't hurt alfalfa if it don't overflow it and stand on it. In sinking down on my lands I think we have to go from two to five
66 feet deeper to strike the water level than we used to. We have to go pretty close to ten feet to reach water now. We have had more water in the river this year than common. The shortage of water in the river that I have spoken of I first noticed about twelve years ago. I have never been up into Colorado to in-

vestigate the number and extent of the ditches. I attribute
67 the plentiful water in June and July in former years to the snow in the mountains, but I have never myself been on the head waters of the Arkansas river. I don't know whether what has been referred to as the May or June rise in Colorado from melting snows has practically disappeared. I couldn't tell what effect the cutting off of timber at the head waters of the Arkansas river
69 has had. The second bottom, like my second bottom, is ten or fifteen feet higher than the first bottom, and on the second bottom we have to go down perhaps twenty to twenty-five feet to find water, and the ground rises gradually back from the sec-
70 ond bottom for perhaps fifteen miles to the southwest from my place. The general drainage is towards the southeast to the river. The waters run pretty nearly parallel with and toward the river, and that is about the same direction a chip floats in my cellar. I have never run a level from the surface of the water in the river to the water shown in any well or excavation at any point to see whether the level of the water in the river or the level of the water in the well was the highest, but I think that they just
71 correspond. This is my notion, from observation. When you get beyond the second bottom on what we call the highlands, say three miles south of my place, the ground water is twenty-five to thirty feet below the surface. We always made calculation that the water ran on a level, and we estimated about how deep we would have to run our wells by the level of the river. When my
72 well was first dug it was ten feet to water; now the water stands from twelve to fifteen feet deep. That well is about a
74 mile and a quarter from the river. My land is more valuable today than it has ever been in the past, and it would sell for more on the market today than it ever would at any time in the past. This is true generally speaking of the lands lying along the Arkansas river in Sedgwick county, and I believe that to be true of lands in the county of Harvey. The complaint I made about the taking of water in Colorado by irrigation ditches to the Government I made about twelve years ago to the Secretary of the Interior. I followed it up with about three letters, and I saw it was getting in too deep water for a private individual and I dropped it. I
75 didn't make any complaint of the irrigation ditches in western Kansas. About twelve or fifteen years ago there was considerable talk among the residents along the river in my vicinity in reragd to large ditches being constructed in Colorado and western Kansas for the purpose of irrigation, and it was my understanding that large operations were being carried on in Colorado at that time looking to the taking out of great quantities of water from the river.

76 I think that the subsiding of this ground water also affects my orchard trees. It has been a gradual reduction. I always
78 put an orchard on the first bottom if I can get it there. I have hopes that they will make good producers. In the good

79 old days we had some high water, but the banks of the river always took care of it. The river at that point was quite a large stream originally. Without measuring it, I would say it was a thousand feet on an average from bank to bank, and there were times when that thousand feet were covered with water. The bed of the river is composed of lo-se, shifting sand that blows with the wind when it is dry. When the high waters come the bed of the river changed and took it clean out. The flood would apparently carry off this drift sand to quite an extent. Whenever high water would come and subside, the river might be where it was before it came and it might have moved almost over to the other side of the channel, and the next flood it might move back. I don't
80 think it was the moving of this channel by some flood and the throwing up of the sand in other places that caused the narrowing of the river at that point. It is true that when the water is absent for a period of three or four years the river is much more apt to close up because of the fact that little trees get started along the sand banks. What I have said about the bottom lands not being as productive as formerly applies to some extent to the second bottom lands as well, but not as much; but there has been
81 some falling off even on the second bottom lands.

I live on a creek. The creek is about two hundred yards from my house. It is sometimes a pretty good stream and sometimes it is—here in the last twelve years it has been dry the bigger part of the time. When I first came there sometimes it would go dry a few months, in September. It has shown a considerable falling off in water in the last twelve years. I would say that this creek is fifty miles long. I have lived on it since 1871. It sometimes has
82 freshets or floods, and when it does it comes within two hundred yards of my house. When it is full, as a general thing the river is full, for the river affects this stream. There may have been a few times when the creek was up and the water was not. It might be affected to a certain degree by local showers. I have never noticed any effect on my cellar when the creek was up at any time when the river was not high. The creek is about on a level with my cellar, but it has a gummy bottom; it don't let the water through quite as readily as it goes through the Big river. It
83 is not as porous. There are tributaries to this creek that run back into the highlands. There is a part of it forms up toward the Big river, and the underflow from the Big river forces the water up. There is a big lake up there and that lake is fed by the river. That is one part of the head of this stream. We call this creek the Big slough; I think on the map it is marked Soldier creek. This lake we used to call Pope's lake, but there is another man who owns it now. I have never made any excavations
84 to find whether the water is proceeding from the river to the lake or from the lake to the river. I think the lake has no tributaries or sloughs or creeks running into it. The productiveness of this land for corn has fallen off for the last twelve years, but I can't

give the production per acre of corn. I know that 1874 was a bad year. I think that year I raised about a bushel to the acre. I
86 have no figures to show whether in the past twelve years I have produced as much corn per acre as I did in the twelve years before, but I know from the husking and the bushels of corn, hauling it in and shelling it and delivering it, that our yield is not as great as it was. I have never kept a record of
87 the production per acre. Some years it rains just in time to make a good crop, even if we don't have any river here at all. Once in a while that has happened. But we are not certain of those rains. The facts in the matter are that we used to depend upon the rain up here—when we had a good flow of water in the river we could depend upon getting a shower, but at the present time it goes off to the north and leaves us fellows to hold the sack. I certainly think that the flow of water in the river has something to do with the rains that fall on the lands. To a certain extent the rainfall has decreased as the flow in the river has decreased. We claim a damage from both the loss of the rainfall and the loss of the water in the river. I don't think that the greatest injury has been because of the lack of rainfall. We depend more on
88 corn on the first bottom, and wheat on the second bottom. The wheat on the second bottom does not depend upon
89 what I call the underflow or ground water. So the only way the wheat has been injured has been by the diminution in the rainfall, and that I think has been for the last twelve years. I have not consulted the weather bureau here to find out whether as a matter of fact the rainfall has been less. We think we have good luck if we get two good crops—wheat and corn both—but sometimes we get a good crop of one and not of the other. Wheat, I believe, if there is any difference, gets along with the least
90 rain. I have been interested in this suit and have talked with different individuals about it. I didn't use my influence to bring about the commencement of the proceedings in the way of securing legislative appropriations or anything of that kind. The only interest I had was the general welfare of the people up and down the river. I have no personal knowledge of the conditions in Colorado, and I don't know anything about seepage or return waters, and have never been interested in irrigation projects in the western part of this State. Once in a while we
91 would catch a man travelling through here and we would gather what little news we could from our newspapers, etc., about irrigation, and that is all I know about the workings in Colorado. I have been a reader of the Wichita Eagle for a great number of years, and to some extent have followed its discussions and writings upon the subject of water. I have actually only taken the Eagle about
92 twelve months. In 1874 the river was practically dry at my place. I have never seen it as dry at any time since. It came pretty close to it several times, but I can't give you the dates. I don't think there has been a more regular or steady flow in the

river of a smaller amount of water, say later in the season—August—September and October—than there formerly was. There have been times when the river went down very low, but I can't recall the exact dates. It takes a very heavy rain to affect
93 this river. You might have quite a heavy rain west of here and not affect the river but very little. It does not take an immense amount of water to affect the flow of this river here.

Recross-examination.

By Mr. ASHBAUGH:

95 The year 1874 was the grasshopper year, and there was a practical failure of crops all through the country that year. The value of lands throughout this whole country has increased in spite of the taking of the water from the river and not because of it. The advance in the value of lands in Sedgwick county is supposed to be the cause of the scarcity of lands, the general prosperity of the Government, the building up of the State, the introduction of railroads and the general development of the country. The
96 taking of this water has been detrimental to the farmers along the river regardless of the general crops throughout the
97 country in general. The certainty of our crops on the bottom lands depended upon the presence of this underflow.

98 Recross-examination.

By Mr. MILLER:

I base the results of 1874 upon a lack of the underflow of the water and not upon a scarcity of rain. In some particulars I have a clear remembrance of the rain — 1874 and in that year there was scarcely any rainfall. It was not so dry that we couldn't plow. We plowed, and raised a crop of grasshoppers.

HENRY JURGENSEN, Mount Hope, Kansas.

100 Direct examination.

By Mr. ASHBAUGH:

I have been a farmer and lived near Mount Hope from 1878 to 1900 and at Mount Hope since 1900. I have been acquainted with the flow of the Arkansas river and the lands along the river since 1878. The flow of the Arkansas river, on an average, during the dry season of the year, during the last ten years, has been three or four feet lower than it was during the same season of the
101 year for the first ten years that I knew it. It has been lots lower than it used to be. It has been dry several times, with no water in it at all. I believe the first time I ever saw the river dry was in 1887 or 1888. During the first ten years there were

holes there where there was ten feet of water, and now I wouldn't say that there was more than four feet. It was mostly from bank to bank. The banks are not more than half as wide as they were then. The banks have narrowed because there was no water,
102 and from a natural cause. The bed of the river has filled up some and is now filled with sand and lots of trees. They generally say that the decreased flow has been because they take the water out of the river in Colorado. The loss of water has not affected the wheat crop very much, but it has affected the corn crop in dry years. The wheat crop don't depend on the underflow, but the corn crop does in a dry season. It affects every crop that depends on the underflow. The underflow, of course, has gone
103 down and has gone down proportionately with the river itself. Our bottom lands have become less productive because of the decreased amount of the underflow in a dry year. In a wet year it doesn't affect it at all, but in a dry year it does, because the first years we raised corn it made no difference whether we got rain or not, we raised corn; but since the underflow went down we don't raise any corn in the dry years.

I bought section 17, 25–3, from the railroad company in 1878. I owned section 8, 25–3, which was a homestead entered in 1871. The bottom lands in Sedgwick county were generally taken up and settled as homestead lands in 1871 and the railroad lands were
104 purchased and settled from 1878 to 1882.

Cross-examination.

By Mr. ROGERS:

I came here from Illinois in 1878. 1879 was a dry year and we didn't have much of a wheat crop. I had corn on the bot-
105 tom lands and it was good. In 1880 the wheat wasn't very good but the corn was good. I am now speaking of the second bottom, because I didn't farm the first bottom before 1890. The first bottom is about half a mile wide at my place. The second bottom, I should judge, is about 16 feet above the bottom of the river. When I speak of the wheat and corn in 1879 I am referring to both crops on this second bottom land. I didn't own the first bottom until about 1890. We are more sure of a corn crop
106 on the first bottom than on the upland. The corn crop in 1881 was pretty fair. It was good up to 1887; that was the first failure. In 1882, 1884, 1885, and 1886 there was a good corn crop on the first and second bottoms. In 1887 it was dry in
107 August and ruined the crop on the upland. 1887 and 1888 were about the same—both years pretty dry—and the corn crop was ruined. 1889 was an extremely good year, the best corn crop we ever had. We had plenty of rain right along. I am not positive about 1890; I don't believe we had a very good crop. It was dry in August. I can't say about the crops in 1891. In 1892 we

had a good wheat crop, but I don't know about the corn crop.
108 1893 was a bad year for both wheat and corn. 1894 wasn't a very good year. We didn't have very good crops on either the bottom or uplands that year. 1895 was an extremely good corn year on both first and second bottoms. The wheat was pretty fair. I expect the rainfall must have been good, else we would not have had any crop. I don't think we had much of a crop in 1896.
109 I don't remember whether it was a dry year or not. We had some crops in 1897. The corn was good on the bottom but the upland was poor. 1898 was a middling year, I expect. I can't remember positively about 1898 or 1899. In 1900—well, I don't know. We had one poor year in corn. I don't know whether
110 it was 1900 or 1901. I believe it was 1901 we had very poor corn. In 1902 the corn wasn't very good. The bottom was pretty good. On the upland it was chaffy—it didn't fill out well. As to the rain, if the corn ain't good the rain must have been short. Whenever the corn isn't good the rain is short. They kind of run together. It does, but didn't use it. In 1903 the upland corn wasn't much. The bottom was pretty fair. Through June and July in 1903 it was very dry, but about the first of August we got
111 rain that made some corn. We call a corn crop here 40 or 50 bushels to the acre. From 1879 to 1885 or 1886 we generally got about 40 or 50 bushels of corn to the acre; after that we had only a few years where we got that much. In 1889 and 1895 we had over sixty bushels to the acre on the bottom land. Since 1895 I should say it would be twenty-five to forty bushels per acre. Several times it fell below twenty-five bushels.
112 The full width of the river as I found it when I came here was never utilized except in flood times; the ordinary flow took up the width of the river from bank to bank pretty nearly all the time. It overflowed once or twice but not much. It generally stayed inside of the banks, even when the floods came. It
113 generally used to fill the banks every June; now it sometimes does and sometimes doesn't. The flood water comes down as often as it used to, but it doesn't stay as long. I have
114 done nothing down at my place to find out the depth of water under the first bottom. On the second bottom I have dug several wells. The first well I had to dig down 16 feet; that was in the winter of 1879. We used it for five or six years and then it went dry. Then we made a drive-well about a mile from the river and a quarter of a mile from the first bottom. We had to go about twenty feet for water. This second well was about
115 quarter of a mile farther inland from the first well. It was on higher ground. I sank this last well in 1880. It is dry now. It went dry in them dry years, about 1886 or 1887. After that we drove a well pipe deeper down, about twenty-two feet. This was where the first well was. We were sixteen feet first
116 and we had to go down twenty-two feet to get water. The second well was sunk in the spring of 1880. From 1879 to

1886, in order to get water we had to go down six feet deeper. The last well has never given out; it is there yet today and it has not dropped from 1886 to the present time.

Redirect examination.

117 By Mr. ASHBAUGH:

During these years I should say the water level has gone down from three to four feet. During the early years we could grow a crop of corn on bottom lands regardless of whether there was rain or not; but in the later years we can grow a corn crop if we have plenty of rain.

W. O. HUSS, Mount Hope, Kansas.

Direct examination.

By Mr. ASHBAUGH:

118 I have lived three miles east of Mount Hope since 1871. I own a piece of first bottom land am engaged in farming and stock raising. The first bottom land near Mount Hope is not quite a mile and a half wide on the south side of the river and about
119 three-quarters of a mile wide on the north side. My land runs within four rods of the river. I see the river pretty nearly every day. I don't think there is anything near the flow in the river during the dry season of the year for the last ten years that we used to have before that time. I think the general flow is from two to four feet lower than it used to be. The river is filled up a good deal on both sides in some places. In some places the bank is changed on both sides and in some places only on one side. I don't think there is any more than half as much clear river bed as there
120 used to be. I think the river bed has narrowed because we don't get as good a volume of water as we used to to keep it cleaned up. We don't get it through June, July and August, as a general thing, like we used to. I don't know but we get pretty near as much water now in September, October, November and
121 December as we did then. I don't think there is anywhere near as much water at the average flow of the river during the dry season as there was during the first ten years that I knew it, because I know that the water has gone down in our ground where we dig. Right at my house it is now six or eight feet to water, and when I first came there I dug a hole in the ground and put a barrel in it, and it raised and fell as the river raised and fell. Sometimes that barrel would be up almost full; sometimes I would have to get down in there and dig out to get any water when it would be dry. It is a fact that the water level throughout the year rises and falls with the flow of the river.

Q. How much, then, has the water level in the first bottom lands

fallen during the last ten years as compared with the condition during the first ten years?

A. Well, I will say now—it is a dry season—it is about eight feet to water, and it would be, as I say, sometimes—I don't know, the last four or five or six years, until I got a pump—of course I have got a pump now. I don't watch the water the way I did when I had an open well; but it never got so that I could get water out of
122 my barrel.

It was just a common barrel, not over three and a half feet high. I think the fall of the water level in the bottom lands affects the different crops raised on those lands in different ways. It affects corn more than any other crop, because if we don't get rain it feeds that corn and keeps it growing if it goes dry. During the first ten years we got corn on the bottom lands without any trouble; lots of it; it didn't appear to depend on the rainfall at all. It got its moisture from below. That is what we always claimed. During the last ten years we haven't as good corn crops on the bottom lands as
123 we used to have. We don't have as good corn as if we had plenty of rain, but we get some corn when they won't get it outside of the bottom. We get half a crop and maybe more. It affects potatoes and vegetables on the bottom lands in the same way as it affects corn. During the early years we could raise crops on the bottom lands from the supply of water under the ground; now we have to depend more on the rain. The river banks have been narrowing for the last ten or twelve years, but I never noticed any narrowing the first ten years. The diminishing of the underflow and the flow of the river has been going on gradually for the
124 last twelve or thirteen years. The river bed is filled up in places with sand, and there is grass and trees growing on it. There are trees there now where they were not twenty years ago.
125 The islands are becoming larger and more of them. The crop of corn, potatoes and vegetables don't equal what it used to be, nor begin to, and it isn't as certain as it used to be.

Cross-examination.

By Mr. ROGERS:

Q. The uncertainty you spoke of in answer to counsel has
126 no reference to the underflow, but to the contingency that even after the crop has been made on the land you may not be able to harvest it?

A. Yes sir.

127 We used to have hot winds in this country, and that is another element of uncertainty, and there are other elements of uncertainty. This year we couldn't make a corn crop because it was too wet. The barrel I put in to get water was a little bit over half a mile from the bank of the river. I think the place
130 was higher than the bank of the stream. There is a slough there; it runs into the country back of the river and collects

the drainage water back southwest. There is only water in it when it rains. It was filled with water this spring. It wasn't from this last freshet or flood. Ever since I first knew it it has been without water only when there came rain, and then it would fill up whenever there was a big rain. I guess we have such a rain about
131 every year. We don't have high water in the river every year. We get some rises that come down every year. We don't have enough to fill the river up to the top of its banks or practically to the top. I think it has only been filled three times in the last ten years. The flood periods in the river come
133 earlier and *and* the volume is less than formerly.

Redirect examination.

By Mr. ASHBAUGH:

During the early years we figured that we had what we called sub-irrigation, and if it didn't rain we could stand the drought. I didn't mean to say in answer to counsel that we were never certain of a crop. The reason the corn crops are uncertain now is that the underflow has gone and it depends almost entirely on the rains.

135 C. E. TUPPER, Mount Hope, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I now live at Mount Hope, Kansas, and have lived five miles east and one mile south of there since 1880, and a mile south and a mile east since 1871. I have owned and cultivated first bottom lands along the Arkansas river since 1871 but no second bottom lands. The average flow of the river during the dry season has been considerably less for the last ten years than it was during the same season of the year for the first ten years that I knew it. It is
136 not nearly as wide as it used to be. About half, I should think. It has filled up a good deal. The banks have filled in by the river being dry and the sand blowing in and trees and grass growing where the river ran the most when I came to the country. It has filled up every year and the islands are
137 getting larger and more permanent. The underflow is not as near the surface as it was thirty years ago, and to the best of my knowledge it has gone down proportionately with the level of the flow of the river. This has affected the crops on the bottom lands quite considerably—corn mostly; other crops not as much as the corn crop. It has not affected other crops to any great extent, because the corn crop is all there is raised on the bottoms. That is the principal crop. It has affected the corn crop because we don't have the water near enough the top of the ground when the dry

spells come. The river is low. When the river raised the water raised underground. If we had more water we would have the corn. We had better corn during the first ten or fifteen years after 1871 because we had more water in the river and had more dew, and the atmosphere wasn't so dry. The corn crop was more certain
138 then than now, because we had more water. Now, the corn crop depends more upon the rainfall than it did then when it was dependent upon the underflow. In the early times, in the seventies, I had an open well which was about eight or nine feet deep and the water in that well would rise and fall with the water in the
139 river. When we had an open well we could tell how the river raised by the water rising in the well. The bottom lands haven't been as productive as they were during the fifteen years from 1871 to 1886. So far as the productiveness is concerned, I don't think the lands are as valuable as they were. During the early years we never had an entire failure; the worst failure we ever had was in 1874, which was the grasshopper year.

Cross-examination.

By Mr. ROGERS:

140 Mount Hope is two miles from the river. It is on the second bottom. I moved on the second bottom last November; before that time I lived on the first bottom. On the first bott-ms my house was about three quarters of a mile from the river. I
141 put in a corn crop every year. I felt as sure of getting a crop of that as anything else; they are all liable to failure. I guess my average corn crop for the last twelve or fifteen years has been about thirty-five bushels to the acre on the average. The market value of the land is probably more now than formerly. It
142 isn't any less anyhow. I put my first well down in 1871 and abandoned it in 1876, I think, when I put a drive-well down. I could get better water. I don't know how deep it was to water at the time I put the drive-well down. I couldn't see the water. The first well I dug down I know how deep that went.
143 I sunk it about ten feet and found water at about eight feet. After I moved to the other place I put one down on that place—one on each place. This was about 1880. In one well I found water at about seven feet, I think. It was about a mile from my first well of water and three-quarters of a mile from the river. I pulled it up and moved it to another place and drove it down again. This was about 1890, I guess, and I found water at about the same depth, right along there together. I drove the wells down. I couldn't say that the water level
144 was any lower at that time, for I paid no attention to it. The water level often rises and falls, but I don't know how much. I know it rises and falls because I see it in the well, during the first few years, but the later years I didn't pay much attention, because the river has been so low. I don't know whether the water level

under the first bottom along the Arkansas river in the section where I live has fallen below its level of a few years ago. I do
145 know it is up and down. I couldn't give a correct idea of it, because sometimes it is up pretty near the top of the ground and sometimes it is lower. It goes up and down with the river.

Redirect examination.

By Mr. ASHBAUGH:

It is my opinion that the water level has gone down in the bottom lands. Swearing to it is something else. There is no water there in the dry season. The river goes dry and makes everything dry. In the dry season the water is certainly lower.

RANSOM H. BROWN, Witchita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

148 I have lived in Wichita since March, 1887, and am a civil engineer and surveyor. I have been surveyor of Sedgwick county for ten years, from 1891 to 1902. As surveyor I have had in my possession and am familiar with the records of the county furnished by the Government of the United States, and the field notes, certified to by the surveyor general for the State of
149 Kansas. From these records and notes I know that the Arkansas river through Sedgwick county is meandered on both sides of the river. I know that similar records are furnished and found in the Cowley, Sumner and Reno counties, and that
150 the Arkansas river through these four counties is a meandered stream on both banks of the river. It is a meandered stream according to the survey of the Government made for navigable rivers.

Motion to strike out as incompetent, irrelevant and immaterial.

151 H. H. HANSEN, Wichita, Kansas.

Direct examination.

By Attorney General COLEMAN:

152 I live near Bentley, Sedgwick county, 24 miles from Wichita. I settled in the Arkansas valley in 1870 and have been familiar with the Arkansas river since that time between Wichita and Hutchinson. I occupied at first 160 acres of land on the first bottom. The first bottom lands at the point where I live, on both sides of the river, are about twenty-four miles wide.

The first bottom lands between Wichita and Hutchinson, on an average are about 17 or 18 miles wide. When I came to the county

in 1870 I should judge the river was about ten or twelve
153 hundred feet wide in the ordinary seasons of the year, and the water generally covered the channel all over from bank to bank. The depth would depend upon the season. At that season it would be from three to five feet in depth. With the exception of 1874, I should judge the depth at the dry season of the year would be considered about from six to eight inches. Within the last twelve or fifteen years the channel of the river I should judge to be about one half its former width. This narrowing has been taking place gradually in the last twelve or thirteen years. When the river is most of the time dry weeds and grass and trees will start and the sediment of the river will accumulate and fills it up.

154 During the last twelve or fifteen years during the dry season we haven't got any river. Some of the time it ceases flowing altogether; if it does not it flows in a narrow channel. I have been speaking of that portion of the river above the mouth of the Little Arkansas which empties in at Wichita.

155 In the year 1874 the stream dried up partially. There were some water holes in it. At those places where I am acquainted with the river the ordinary flow was from three to five feet deep. This would be the ordinary flow in April, May, June and a part of July; after that the water gradually began to go down and the depth got less, and ordinarily in September, October and November we had about six or eight inches of water across the whole width of the channel, excepting some islands of course.

156 Q. Now, when you first went into that country what, if anything, did you discover in regard to an underflow of water under the surface of the land?

A. Well, I have on several occasions, that I am satisfied that there is an underflow.

In 1870 I dug a well and I always found that the sand would bank up in the northwest corner of that well; that is, the sand would drift up. That indicated to me that the water came over there and pushed the quicksand up. I had to dig three or four feet, and I had plenty of water and that place where I dug the well was on a little rise and I had to go about eight feet, but in general we had to go three or four feet, in the lower part of that land. I noticed at that time a difference in the level of the water in these excavations. The variation of the current is from three to five feet, and we always went by the river. We didn't need to go to the river to see how high it was, we could always look in our holes and see just when the river was falling or rising. The water rose and fell just according to the river.

157 I can't state how long it took after the channel filled up before the water in the well rose correspondingly. This well was about three and a half miles from the river. The current of the water in the bottom of the well was parallel with the river. I have noticed it in some other cases. In 1893 I built a house in Harvey county and dug a hole to dig out plastering sand, about six

feet square, and then we got sand and water. When we would throw out sand we found we had the sand banked up on the west and northwest side of that well a couple of inches higher than the rest of it. The quicksand had drifted in from the northwest and drifted toward the southeast. It was always in the same direction.

158 Within the last twelve or fifteen years at the first place that I talked of I noticed a difference in the depth it is necessary to go to reach the underflow. It showed itself gradually. It appears that we have to go from three to four feet deeper to strike water than we did in the seventies. I own that land yet and we are digging holes once in a while, and I know what I am talking about. In that part of the county on the first bottoms we raised corn. It was just sure for a corn crop whenever we put it in. We could raise corn whether it rained or not. Whether there was a

159 failure in the country at large or not, we had never known of a failure but 1874, and of course our underflow was too deep; everything was dried up. It is a fact that when there was a failure on the upland we raised corn on the first bottoms, except in 1874, and we put it to the underflow, that our land would hold the water. Within the last twelve or fifteen years, if we get plenty of rain we can raise crops yet on the first bottoms, and if we don't we

160 sometimes come mighty near falling. Within the last twelve or fifteen years, whether we raise a crop or not depends on whether we get plenty of rain in the right season. In the early days it didn't make any odds if we didn't have any rain for sixty days, we could, on land in general, with the exception of some spots that underlaid that hard ground—we could always go in the morning and we found the whole soil black—damp, and right at midday when the sun scorched it up and it was hot, we merely needed to scratch down with our finger only one eighth of an inch and we would enter moist ground. Of course the subsoil of our land is a kind of sandy loam and will hold water like a sponge and draw it up from below. Within the last ten or twelve years we have lost all that. It is dry.

161 A year ago last spring I dug a cellar at Bentley. We dug down to quicksand and walled it up. It happened to be a pretty wet spring and we got water in that cellar, and when the water got out we found that on the northwest corner there was a mark of sand about four feet square, six inches higher than the rest of the bottom of the cellar, which showed that the sand had washed under the wall and raised up in the cellar. It is my judgment that this effect of the underflow as described extends throughout this whole bottom, but my experience does not extend that far. I could not trace the underflow any further than up to the Little river, which would be somewhere around eighteen miles. This changed condition which we have found in the last ten or fifteen years has extended over the whole bottom.

162 According to my observations the productiveness, by reason of the subsidence of the underflow, has decreased not less than thirty-five per cent., and that condition extends all over the bottom so far as I know it.

Cross-examination.

By Mr. HAYT:

163 I first located in this county about thirty miles above Wichita and took up one hundred and sixty acres of land. We didn't have any trees at that time with the exception of cotton woods here and there on the river. There were no trees except near the river. There were grasses of all varieties growing on this land, mostly buffalo grass, a pretty good stand at that time, and that was the general condition of the bottom lands between Wichita and my place. I cannot exactly tell about the first bottoms, but I know that the fellows from the second bottom came down and cut their hay on the first bottom. I couldn't say how much higher my land lay than the river channel; I never levelled it off, but when we dug a hole our water and the river water were always considered to
164 be on a level.

I can't tell anything about the level of my land. I don't know whether it was higher than the river bottom or lower. I didn't cultivate my land in 1870. In 1871 I raised about fifty acres of corn, a good crop, about thirty-eight bushels of sod corn to the acre. I have raised corn every year since. I can't say how deep the corn roots go. They go deeper in a dry season than in a wet sea-
165 son. A corn root goes down at any rate from 14 to 15 inches. Didn't raise anything else than corn in 1871. In 1872 I had corn and oats, about sixty acres in corn and three acres in oats. The corn yielded about 38 bushels to the acre. In 1873 we raised good corn crops. In 1874 we had a failure in corn. We had a few
166 acres of wheat that were good, and I had ten acres of oats that were good. The river was entirely dry during a portion of the season of 1874 in the fall of the year. I think the condition was about the same between Wichita and Hutchinson, all over, at that time. So far as I travelled up and down the river it was dry. We had plenty of rainfall in the early part of the season, and then we had rainfall through May, and then it turned dry. The drought commenced in June and lasted somewhere about ninety days.

167 Since I have been in Kansas corn has been my principal crop. My crops have continued about the same until about
168 1890. Of course I have some land that I don't claim to be affected with sub-irrigation; that is what is underlaid; but what I am talking of is the general land that is affected by sub-irrigation. About ten per cent. of my land is underlaid with hardpan and on those lands the crop depends entirely upon the rainfall. I have noticed that our crops have gradually decreased for twelve

or thirteen years and we were more subject to drying out than we were in the first years. This year, 1904, we have no crop at all, because it has all been drowned out. We had too much water
169 this year. In 1903 we had all the water we needed, that is, in some parts of the year. We had in the first part of the season much water, and then it turned dry and what little corn there was was dried out. We had a fair crop in 1902. I have planted part of this same land to corn from 1870 up to the present time. I have never fertilized it, not any more than the vegetation
170 that grows on it. I always plough in what is on the ground. My place is about eight miles from the Little Arkansas river. We have got a creek there we call the Kissaway. It is about two miles away. Part of my property is within a mile and a half and part of it two or three miles. I have noticed no change in the volume of water in that creek in the last thirty or thirty five years. It runs a little more now if anything. It is not a constantly running stream. It goes dry every season. It is generally dry all the seasons through with the exception of April, May, June and
171 July. It is a dry creek. One day it may be away up and to-morrow down.

The water in the Little Arkansas river depends on local rains. Some times it is away up yonder, and sometimes—it is a
172 stream that never goes dry. It is flowing as much water now, if not more, than it did in 1870. According to our surface water, the Little Arkansas river is lower than the Big Arkansas river. It flows into the Arkansas river.

173 In that well that I have spoken of I had to go about seven or eight feet to water. I struck the wet sand at about six feet; it was full of water; the water was percolating through it, but not in every direction. The water came always from the northwest; that is where we noticed it first, always going from the northwest to the southeast. As we dug down the water didn't
174 come in from all sides. What I mean is, I could see where the water came in first. I could see where the most of it came in. I noticed that the hole got full of water. I don't know that if you dig down in wet sand the water comes in from all directions to the same extent. If you go deep enough, I admit that the water must come in from all sides, but when you get just to the water I say it does not. The depth of the hardpan from the suface
175 varies. It is found in some places right near the top. In one place I dug down sixteen feet, and when we got down to that depth the water burst up that remaining two feet of hardpan. We found the hardpan right there on top. There was eighteen feet of solid hardpan where nothing could get through. That must have been about fourteen years ago. I couldn't say how long the water remained at that level, because I put a curbing in there to
176 make an irrigation plant. It was a hard spot where I could build a reservoir that would hold the water. When I put in a curbing I sank down a four-inch pipe and then I put a mill to it

and built a reservoir and a pump, a big pump, and then we filled up the hole. I can't tell whether the water remained at that height, eight feet from the surface, or whether it receded.

179 When I first came the channel of the river or the river bed was from one thousand to twelve hundred feet in width, and in the dry season, what we would call the lowest water, the water would be from six to eight inches in the channel. When the channel was only six or eight inches in depth the water would not flow the whole width of the channel because there was always sand bars and islands in the river. The stream at any rate was two-thirds of the width that it was when the bed was full. This cellar that I dug at Bentley was about two and a half miles from the river, and the first well that I dug was about three and a half miles from the river, and the well where I put the reservoir was about four

180 and a half miles from the river. I dug that cellar last spring a year ago. That is two and a half miles from the river. I dug it four feet deep. When we got down four feet we got onto the sand and knew we couldn't go any deeper and we just built up a wall right on the sand. We walled it up six feet high and put a building over it. After we had that cellar dug the water came in.

181 That was in June, 1903. I think the water got about three feet deep in the cellar. The cellar was four feet deep and the water came within one foot of the surface.

182 Cross-examination.

By Mr. ROGERS:

I had noticed the rise and fall of the water in my wells since 1870. The well I speak of is three miles from the Arkansas river. I have never noticed a rise or fall independently of a rise or fall of water in the river. I can't tell you how soon after the river rose the water in the well would rise. Our land sometimes gets pretty wet and our land never would dry out before the river would fall.

183 I know of one instance when the river rose as the result of a cloudburst somewhere up there in Colorado or Kansas, and two days after that I found in Dr. Hunt's pasture, which is three miles from the river, the water raised right up in water ponds in low places where they had rain and they needed rain before. I think that water had risen up from the water that came down in the big Arkansas river, or at least related to it. That was my supposition. I had been there before and know the places were dry and needed water.

184 There were years prior to 1886 when the rain fall was deficient or was lacking, but I wouldn't undertake to give

185 the years. I can't go back of 1885 or 1886. I mean that I can't bring any proof after 1886. I have a book and I could tell you the situation prior to 1886 if I have that book. I remember a droughty year prior to 1886—the year

186 1874. I don't remember any other extremely dry years. There were other years that could be considered droughty.

We had one last year and we had some dry seasons prior to 1886, but I can't tell you what years they were, only 1874. That was an extremely dry season, and we had dry seasons in them years. 1874 is the only one that I can remember and give the year. When we had droughts all the crops not on the bottom lands failed.

188 We do not now have a period of high water in the Arkansas river every year. We had it the first years I came here. The floods of late have stopped, with the exception of once in a while. They have been gradually stopping for the last

189 twelve or thirteen or fourteen years. There is not one-fourth of the water, taking it all through, coming down this river now, that there was in the early years. So far as the high

190 waters are concerned we do not now have more than one-fourth of the water coming down at high periods that used to come down. Even our June floods, or what we call June—the water in June—is not as high as the general run was of the river then in the dry season. Sometimes we don't know whether we have got the June flood or not. We can't say that we have any

191 more in June than at any other time of the year. It is the general understanding in this neighborhood that the Arkansas river has been dammed in Colorado and the flood waters stopped.

Redirect examination

By Attorney General COLEMAN:

196 The patch of hardpan where I dug the well when we went through the hardpan was about four rods wide and about eight rods long.

197 We can tell from looking at the surface or the kinds of crops grown whether the land is hardpan or not.

Recross-examination.

By Mr. HAYT:

198 At the time I dug my cellar last year the condition in the country was ordinary. It was not dry and it was not wet. That was about the month of March. The water came in the latter part of May and receded in June. The rainfall in the month of May was quite heavy, a little heavier than the average. I can't say whether the month of May, 1903, was considered here in this community as one of the wettest months of the last ten years. I know that the rain fall was very heavy during the month of May, 1903. It was heavier than usual.

199 D. E. BREESE, Wichita, Kansas.

Direct examination.

By Mr. LOOMIS:

I have lived in Sedgwick county, Kansas, for the last twenty-six years, and about eighteen miles up the river northwest from Wichita. I have owned land adjacent to and near the Arkansas river during that time and have now something over a thousand acres.
200 My land lies about two miles north of Colwich in the Arkansas valley. My land doesn't all lie in a body, and I have owned land along the Arkansas river for twenty-five years. During this time I have been acquainted with the Arkansas river and have observed the flow of water in it during the different seasons of the year. I settled in the Arkansas valley in 1878. Leaving out what we used to call the high water period, commencing perhaps
201 in the middle or latter part of May, and extending up to perhaps the middle or latter part of June, from that on during the growing season the water used to average at least two to four feet deep during all the growing season and fall. I mean by "growing season" July, August and September and on through the fall. The stream of water in the river during those months was then from bank to bank. Along in the neighborhood of 1880 or 1890 or something like that it gradually got less for a few years and then stopped altogether. We haven't any river, practically, with the exception of now and then a short flood period since that time. It is just a range of dry sand bars opposite my farm during the whole of the year, with the exception of what we commonly call here the flood period, which would be the latter part of May and the fore part of June. We have no river at all, practically, and not only that but when we get the high water flood the river does not stay up as it used to. In a week it will be clear down again and the river will be gone. We formerly had a flow of water several feet deep from bank to bank during the same season of the year under similar conditions, but now we have practically no river at all. This condition of affairs has existed about twelve or fourteen years.
202 I have knowledge in regard to what is called the underflow under the bottom of the Arkansas river. When the river will rise a foot or two or five feet the water will rise right under the farm land, right under my place, and I will state why I know. I have dug probably forty or fifty wells in the neighborhood of where my farms are located. I dug an open well on the northwest quarter of section 33 and curbed it up and drew water out of there with a bucket for a number of years. You could tell just as well by looking in that well the condition of the river as though it was at the river. When it was bank full it would fill so that you could dip the water out of the well by still keeping hold of the bale of your bucket, and as the river would fall the water would go down

three or four or five feet, and for the last ten years there has been no water in that well, with the exception of that flood period. This underflow extends under all the bottom land of the Arkansas river. The bottom land of the Arkansas river in the vicinity of my lands are about four miles wide on the south side of the river, but in the neighborhood of twenty miles wide on the north side.

203 I am quite familiar with all the valley land from Hutchinson to the Oklahoma line and should say that the average width is from twenty to thirty miles, but it narrows down pretty well at Hutchinson. From Wichita to the Oklahoma line it would be twenty or twenty-five miles wide easy enough, principally on the west side of the river. The underflow between Hutchinson and the Oklahoma line is about the same, I should think, as it is in the neighborhood of my lands. The surface of this underflow has gone down, in my judgment, at least four or five feet. The fall of the underflow seemed to be gradual from along about 1888 to 1890, but after about 1890 or 1891, it always furnishes plenty of water for stock, but has been dry from that time on, with the exception of the flood period. Of course whenever the river is up there is plenty of water in the well, but when the river is down so that it don't

204 run in the river there is dry sand in the bottom of the well and we are forced to drive on below there for water. The fall of the underflow corresponded with the diminution of the flow of the water in the bed of the stream, and took place at the same period of time. The effect of this fall in the underflow upon growing crops in the Arkansas valley on my farms has been a depreciation in the crops of at least one-third.

205 When I first came to Kansas the farmers in the Arkansas valley were not dependent to any great extent upon the rainfall in raising corn on the bottoms of the Arkansas river. This was on account of the sub-irrigation, as they call it, in the valley here. By this sub-irrigation I mean the underflow. The corn got its moisture from the underflow and was not dependent on the rainfall. This condition lasted until late in the eighties or nineties or something like that. Since that time most of the growing season, with the exception of along in May and June, we would not have any water in the river scarcely. This affected the growing corn because the underflow would be that much lower. Whenever the river falls the underflow would be about that much lower. In the early days when the river was high, on the road or in the corn field, when it looked perfectly dry on top in the middle of the day the ground would be perfectly moist underneath. This existed from the time I first came to the State until about 1889 or 1890. This

206 condition ceased, with a few exceptions. When we have a good season, with the river full, we see that as we used to. This stopped about 1890 and has been that way except in flood periods when the river was bank full or nearly so. In order to secure a corn crop now in the valley of the Arkansas river the farmers are compelled to rely for their moisture upon the rain fall.

I have had considerable experience in digging wells and in hunting and gunning, and if you dig a hole in a sand bar it will
207 begin to clear on the up-stream side. It will do the same thing in a well.

Q. Have you made any observations beyond the river banks?

A. Yes, sir, in those wells I am speaking of.

Q. What is the character of the observations you made?

A. Just observing where I dug the different wells and the different holes in the bars at the river. Without any exception the water will clear on the up-stream side first before it does on the down-stream side.

Q. That is true in the wells you have dug?

A. There is no exceptions to that, as far as my experience has gone.

Q. Indicating that the current flows in what direction?

Mr. HAYT: We object to that as leading and suggestive, putting in the mouth of the witness the answer which counsel desires.

A. To the southeast.

Q. How did that correspond with the direction in which the river flowed?

A. Parallel.

Q. Parallel?

A. Yes, sir.

Q. To what do you attribute the necessity of farmers along the Arkansas valley being compelled to rely upon the rain fall in the production of corn in the last few years?

A. It is for the lack of water in the river.

Q. And how does that affect the underflow?

A. Why, the underflow is that much lower. As the river falls a foot or two or five feet the water under the ground falls as much lower.

Q. You have been compelled to rely upon the rain fall since the underflow went down?

A. Yes, sir.

Q. And before the underflow went down you were not compelled to rely upon the rain fall?

208 Mr. HAYT: We object to that as leading and suggestive.

A. We didn't depend upon the rain fall in former days, no, sir.

Cross-examination.

By Attorney General MILLER:

I first settled in the Arkansas valley about twenty-five years ago. My lands are all what you call first bottom land, and are about a mile and a half back upon the river. I have been growing
209 wheat and corn principally, and have rotated the crops on the lands. Since 1890 my crops at the least calculation have

been one-third less. Crops are not as good this year because they were damaged by too much water. Ordinarily we would have good crops when we had a good rain fall, and previous to 1890 we
210 would have good crops irrespective of heavy rain fall. The river has gone on decreasing since 1891. There has been a remarkable change since 1890. I attribute it to the water being taken out of the river—the lack of water in the river. I don't know what has caused it. There is a lot of dry bars north of my farm over there where there used to be a good stream through the growing season, two to four feet deep. There is three fourths of the time between the first days of July and on until fall that a person can go through there dry shod. The depth of the underground water beneath the surface in the first bottom lands depended altogether on the condition of the river. The well that I spoke of in front of the barn there where I had occasion to draw water about three
211 times a day, when the river was nearly bank full, we could dip out of a bucket, having hold of the bail. When it was
212 low down it would take a piece of rope probably five feet long to reach it. It would vary. Then I could dip it out with a pail. It was probably twenty or twenty-four inches below the surface. That was when the water was pretty full in the river. There were some years between the time I settled at Colwich down to 1890 when the river was extremely low. I can't just tell the years. There were no years prior to 1890 other than the year 1874 when the crops were so very poor that it specially impressed itself upon my mind. Since 1890 there was one year of low crops that has impressed itself upon my mind. That was in 1901. In July and
213 August of that year we didn't get much moisture. The rain fall was pretty fair in the spring. I sold the biggest part of my corn crop that year for seventy-five cents an acre, fodder corn and all. I usually get forty cents an acre for the stalks after the corn is gathered. The wheat crop was good that year. That was in 1901. I never had anything between 1880 and 1890 as small as for the year 1901. I was farming during 1880. We had good corn all along then through those years. I recall one year when the corn was extra good, but the year I couldn't give, but I guess it
214 was about 1884 or 1885. I don't know how far beneath the surface of my land I have to go to reach this underground water at present. The well I am speaking of always furnished plenty of water for any amount of stock until about 1888 or 1889. You couldn't bail it down; but now in the dry weather when the river ceases to flow there is no water in it. I don't know how far the waters have receded below. We went to work and drove a point down and made a drive well. I have no knowledge at all of the depth of this underground water below the surface at present.
215 There is a world of water, if you go down to it. I don't know how deep this underground water goes down. I don't know of any point along the river where it has ever been possible to find the depth of that water. With the exception of May, a week

or two, in the flood period, the river is practically dry
216 There is no river. The general effect of the value of lands here as the years have proceeded has been that land is worth more money now. Prices have gone up all over. There has been a general rise all over the country. There hasn't been much change in price for several years in Sedgwick county. The first bottom lands are the more valuable. The winter flow of water, beginning with the month of December, for the past ten years does not correspond with the flow during the same months for the years previous to 1890. There is no comparison in that regard. Previous to 1888 there was a bridge built across the Big Arkansas river between Colwich and Bentley, about 1880, I think, and during eight
217 years, I guess it was, the water was high enough during the winter so that when the ice went out it broke as many as four times. Not every winter, but as many as four times in about eight years. Since 1890 there has been no water to make any ice. Water here in the well, if you will stand still and watch it, within five or ten minutes your water will begin to get clear on the up-stream side of your well. The water will not clear in days in Illinois in the country I lived in. I am not able to give the years when the crops were the lowest. I have kept no book of accounts nor dates nor anything of that kind and could not recollect anything unless
218 something particularly impressed itself on my mind, like the failure of corn in 1901. That is the only one that has been so much out of the ordinary as to impress itself upon my mind sufficiently to fix the date. That is the only season we have ever had a total failure of corn in 25 years. In quite a number of years since 1890 there has only been half a crop, but I cannot give the years.

219 I am in the land business, selling, myself, quite extensively. A large part of my business—in Illinois in the same period the land has gone from fifty to a hundred dollars an acre, but the land has advanced here correspondingly I think. The quality and productiveness of the lands has remained the same in Illinois. I mean to say that lands that have any merit at all have advanced all over the country. In this advance in price I do not think there has been very much difference between the bottom lands
220 and the second bottom lands. The land has not doubled in value here in the last twelve years. I think it has increased
221 fifty per cent. I don't know of any lands that have been sold around Colwich or Mount Hope in the last two years.

Redirect examination.

By Mr. LOOMIS:

Q. Now, please state if the farmers would be more contented if they had the underflow back to where it was in 1878.

Mr. HAYT: We object to that as leading and suggestive, and also as irrelevant and immaterial.

A. They certainly would.

Q. Please state if the farmers would be more contented in the Arkansas valley if they had the flow of the water back in the river during the dry seasons as it was in 1870 and down until about 1890.

222 Mr. HAYT: Same as last objection.

A. They certainly would.

There has been no land changing hands recently in the Arkansas valley to my knowledge, and I am not able to state its value.

Q. Please state if you can how much more valuable it would be provided you had the underflow under the land similar to what it was in 1878.

Mr. DAWSON: We object to that as purely speculative.

A. At least one-third more.

223 Since 1890 the fertility of the soil is one-third less than what it was about 1878. This is caused by lack of moisture.

224 We have been rotating in crops and have been trying to farm good. Corn in this country matures about September. It now not only requires a sufficient amount of rain fall to make a corn crop, but the rain fall should be properly distributed

225 throughout the growing season. Corn in this valley has been only occasionally injured by too much rain. The farmers in the Arkansas valley have not only been injured from want of moisture for their crops, but also in lack of water for their stock

226 and domestic purposes. This lack of moisture and the lowering of the underflow has damaged the crops to a great extent.

Recross-examination.

By Mr. ROGERS:

227 I first ascertained the cause of this changed condition in respect to the amount of water in the river by reading an account of it in the papers, the "Wichita Eagle" for one. To some extent I think it gave an account of the cause, referring to their ditches and reservoirs and taking water from the river. I think this was about ten or twelve years ago. We had been hearing of it prior to that time. They were putting ditches in out there. We heard they were appropriating the water in the State of Colorado, and that was taken as the cause of the lessened flow here so far as I know.

229 Most of this talk has come up within ten or twelve years. Of course there was talk before that but it got to be very gen-

230 eral along perhaps in 1892 or 1893. I have never asked any one how much they thought they were injured. We have talked about being damaged, all of us. I understood, in answering the question propounded by counsel, in saying that the people along this river had been injured, that they wanted to know what amount

I had been damaged, and I told them at least one-third. The answer is applicable to the valley in general. The lands in the valley lie all about the same. If one man is damaged by the
231 shrinkage of the underflow they are all damaged alike. I argue that because I have been damaged everybody else along the river has been damaged.

232 The first two farms I bought, I bought of the Santa Fe Railroad Company. When they were selling their grant lands through here the first bottom lands were at least thirty to thirty-five per cent. higher than the second bottom or up-lands, and they have continued to be higher. All the people that were selling claimed this was on account of sub-irrigation. There has not been very much land changing hands there within the last two years. There has been up-land farms that have sold within the last four years as high as anything has ever brought in the bottom. I have nothing in mind in the bottom that sold for anything more than the up-land has been selling for in the last three or four years.

233 I don't know of anybody moving off or selling the land because of any effect that has been produced by the flow of the water in the river. I have never heard of a case of that kind.

234 From 1890 on up there has been practically no water in the river in the fall and winter. Prior to that time there was so much water in the river in the fall and winter that a man with boots would have to be careful in crossing it. I don't
237 know what land is selling for. I have no price on my land; it is not for sale.

239 H. H. HANSEN (recalled), Wichita, Kansas.

Further cross-examination.

By Mr. ROGERS:

When I was talking about the amount of water flowing in the river this morning, I was talking about the amount of water in the river at the time the crops were growing, in the summer. In the fall and winter we had from about six to eight inches. We would consider that a good flow now; we didn't then. That flow continued up to some dozen years ago. It didn't all disappear at once.
240 It came gradually that way. It got less and less. I can't say whether the water in the river in the winter now is less than when I came to the country prior to 1890, but I do know that we haven't got it in the fall of the year.

Redirect examination.

By Attorney General COLEMAN:

241 I can't compare the amount of water in the river in the winter time since 1890 with the amount of water before 1890, because that is the time of year when we didn't care anything for water and I didn't notice it.

243 G. M. SHIVE, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Burrton, Harvey county, Kansas, since August, 1885, and I lived prior to that time two miles southwest of Burrton. I settled there on the fifteenth day of April, 1874. My present residence is about eight miles from the Arkansas river, and my first residence was six miles. My lands were first bottoms; it was a sandy soil, black loam mostly. I have been acquainted some-
244 what with the average flow of the river in the early years. The average flow of the Arkansas river during the dry season of the year, leaving out the months of May, June and July, for the first ten years after I settled on the first land, was not more than one to two feet deep. The average flow of the river during the same months and leaving out the same months for the last ten years has been fully one-third less. It is one-third less in height. During the first years I should say the river on an average was eighty or ninety rods wide. Since I first knew the river the banks have narrowed, I believe, one-third. I have been acquainted with the river up and down there for eight or ten miles, and I think the average
245 width has decreased one-third through the whole eight miles. That is my judgment. We generally understand it has been on account of Colorado taking off the water supply.

There is such a thing as an underflow; it extends back as far as to Burrton and back to the Little river. It extended under the land where I first lived. I have had occasion to observe this underflow at Burrton lately. The Santa Fe has a large railroad well there about 22 feet deep and 12 feet across. The underflow has gone down since the first years that I knew it. I am not able to answer, hardly, how much it has gone down, but I know the water doesn't stand up so near the surface nor as high as it used to.
246 It is six or eight feet lower. I have had occasion to notice whether the underflow rises and falls according to the rise and fall of the river. It does. When the river is high the water rises up in that well at Burrton, eight miles from the river. There is a current to this underflow there. It flows to the southeast. I observed it in that railroad well at Burrton. In one of those dry years back probably eight or ten years ago the well gave out and the company went to work to dig the well deeper, and *the* while they had the top torn off I had occasion to notice it a time or two. One time some others and myself were looking down in the well. The water was clear and we could see the bottom plainly, and while we were there we dropped down some little sticks and one thing or another on the water and we could see it float gradually to
247 the southeast. The lowering of the underflow on the first bottom lands has had the effect to cut the corn off badly from

want of moisture. During the first years after I went there it got its moisture from sub-irrigation mostly. During the last five or ten years it cannot get moisture from the sub-irrigation, not so much any way.

Cross-examination.

By Attorney General MILLER:

Where I located at Burrton we always understood that it was in the first bottom. There is no bluff between us and the river;
248 it is level, so far as I can tell. When I first settled there in 1874 the underground water was usually about six or seven feet from the surface in the dry seasons. There was no particular change between 1874 and 1885. I first noticed the change somewhere from ten to twelve years ago. The first thing that attracted my attention to the change was when our ground would get rain it wouldn't seem to last any length of time. The corn would wither up. It seemed the same amount of rain didn't do the good it formerly had done. I have never made any experiments or tests,
249 or anything to discover how much the underground water has fallen. I have heard a number of farmers say that they had sunk their wells deeper for water. I haven't had to make any change in mine. I don't know the depth of the water after we reach it.

250 When I first located there the water was about six feet below the surface of the ground on my place. I produced good crops when it was that low. Right now the water is not very low, but during the last three years it has been from three to six feet lower than during the earlier years. I haven't looked into that railroad well for several years until yesterday; now the
251 water is about nine feet from the surface. The time when they dug the well deeper I guess it was sixteen feet down to the water.

252 At Burrton the Little river is about six miles from the Santa Fe railroad. I have only occasionally seen the Arkansas river of late years during the winter months. There is not near the amount of water running that formerly ran when I did see it.

Since 1889 we haven't had a big corn crop in that country. I don't remember about the years since except that in 1901
254 there was a complete failure. It was a very dry year. For the last ten years the average corn crop through our country there has not exceeded twenty bushels. I have rotated the crops but haven't used any fertilizer. I believe it has been in some sort of a crop every year. Land is worth more now than in 1885.
255 Outside of boom periods, I think land is worth a little more now than formerly. I do not desire to sell my land. I am perfectly satisfied with it; I think it is a pretty good investment.

256 Redirect examination.

By Mr. ASHBAUGH:

When I stated that I was satisfied with my land, I would be better satisfied with it if the underflow was restored as it was when I knew it first. It would be more profitable and valuable to me.

257 SILAS RUTLEDGE, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live now in Woods county, Oklahoma, for the last two years. Prior to that time I lived in Eagle township, Sedgwick county, upon the Arkansas river, on the southwest quarter of section 34, 25-2. I settled there in January, 1871, and lived there until 1902. My land was bottom land and was within 40 rods of the Arkansas river, on the south or west side.

258 I observed the flow of the river during the thirty odd years I lived there. The average flow during the dry season excluding the months of May, June and July, for the first ten or fifteen years that I lived there was about I should think from two and a half to three feet deep. The width of the river varied in

259 places. Right east of my place I should think it must have been twelve to fifteen hundred feet wide from bank to bank. Just north of me was a point where it would be between five and six hundred feet wide. This is the narrowest place I know of between Wichita and Hutchinson. The average width of the river I should think would be about eleven hundred or eleven hundred and fifty feet. For the last ten years it is a hard question to

260 answer what the average flow of the river has been, because the river went entirely dry, and there would be no flow at all. From about 1888 to 1902 the river generally went dry in the month of August and remained dry until probably October. The last of September and the month of October it usually went dry. During the winter time there was generally I should think probably six inches of water.

I have had occasion to observe the underflow. When I first went there I dug an open well on my place, and while I had that open well I could see at times that the water was higher in it than it was at other times, and by observing the height of the water in

261 the river forced me to believe that the rise and fall of the river had to do with the water in my well. It corresponded. When there was high water in the river there was a corresponding height of water in the well, and when there was low water in the river it was low. During the last ten or fifteen years the level of the underflow has gone down from three to four feet. The falling of the underflow has diminished the productiveness of the soil. We don't get as heavy corn crops as we used to. Our corn crops are not

so certain. They are not so certain for the lack of under-
262 flow, as I consider it. During the first fifteen years our corn crops were practically certain, but during the last ten years they haven't been. During the first ten years I felt positive that we could raise corn from the moisture of the underflow, and we did. During the last few years we have to depend on the rain fall, and whether the rain falls opportunely or not. I should say that the fall of the underflow has affected the general productiveness of my land from one third to one half. This applies to all crops that depend upon the underflow for their moisture. I can't say how far back the underflow extends from the river. My observation was on that particular quarter section I spoke of, and I would not like to state about others.

Cross-examination.

263 By Attorney General MILLER:

This piece of land that I lived on was right up the Big Arkansas river northwest of here about nineteen miles. I sold it for fifty dollars an acre. I paid $22.25 for it in 1870. I got it from the Government. At the time I settled there the water was flowing
264 in the river all the time, and as I said, I dug an open well there in the winter and I went down nine feet before I struck water. This was in December, 1870, or January, 1871. It was on the highest land that I could get onto. I should think there
265 was about 40 acres of my land that was lower, I should say five or six feet lower. I noticed that change in the water somewhere in the 80's, I think, probably in 1887 or 1888, somewhere along there. That is when I noticed the underflow
266 water commenced to sink lower. We ceased to get the water in the river, and consequently we ceased to get the sub-irrigation we had been used to. I had a pump at my hog yard where I watered my hogs and it was only about twelve feet deep. I had to put it down deeper to get water on account of the water sinking below the point of that pump. I think I made it sixteen feet deep, then I got plenty of water. This underflow came within about five to nine feet of the surface during the good times along in the seventies. Corn was my principal crop. I did not rotate my crops or fertilize the land in them days.

267 The last year or two I was there I hauled manure on the land and rotated the crops. The rest of the time I went on growing corn without fertilization or changing it. I didn't rest the land during any year.

268 There was a bridge put in in 1881, I think, right north of my house, and there came an ice gorge in the last of February or first of March soon after that bridge was put in and carried the bridge out.

In 1888 when I noticed the falling off in the water the
269 crops were shortened up. In 1889 we had a good corn crop. It was exceedingly good, but not so good in 1890. In 1891, 1892 and 1893, they were short.

The thing that kept up the value of my land when there was a continous, protracted falling off in the crop yield was the de-
270 mand for land. Land has increased in Illinois and all the Western States. There has been nothing done to rob Illinois
271 of its natural advantages.

272 Cross-examination continued.

By Mr. ROGERS:

I know Mr. Houston, the attorney, in Wichita. I have talked with him about this matter. He went to Colorado at my suggestion. My neighbors and I had been talking about this matter for several years previously. The first that I recollect of hearing
273 about this water were my own utterances. I think it was in the 80's there was a meeting called in this city, a mass meeting of the farmers of Sedgwick county, to take up the interests of the Sedgwick county farmers. I attended that mass convention. At that time I had observed this diminution in the flow of the river and of the water under the bottom lands. I believed it to be caused by the ditches in Colorado taking the water out of the river. I made that statement in an open meeting attended by farmers living
274 along the river. I presume they all heard it.

I have never been through Colorado. I went up the Arkansas river as far as the Santa Fe railroad goes. I was on my way to California and cut across the corner of the State of Colorado. I went as far as La Junta in 1889. I think this agitation began somewhere from 1886 to 1889.

275 I don't know positively what reports were published in the "Wichita Eagle." It often spoke of the ditches being built there, but exactly as to what the reports were I can't tell.

I believed the irrigation development in Colorado deprived us of the water, and finally I thought it was diminishing the value of my land. I am very sure that it did; that is, that it diminished the value of the lands for the growing of crops. We couldn't grow so much crops. I naturally supposed that in the construction of the ditches a large expenditure of money was required. I never
276 entered any suit to stop the building of ditches in Colorado or the diversion of the waters of the Arkansas river.

278 We have expected the State of Kansas to win this suit in this case, and, as citizens of the State of Kansas, we would be benefitted by Kansas winning the suit. There have been several meetings in this part of the State in which this suit was discussed, but I can't tell exactly how many. They were probably during
279 the years from 1890 to 1900. The thing was pretty thoroughly agitated from 1890 to 1900.

283 The depth of the soil on my land I should think is from three to six feet. It was desirable to have the water in the soil itself. There was a difference in my crops. The deeper
284 the soil, if not too deep, the heavier the crops. I think the deeper the soil the surer the result. Along this valley crop conditions are determined to some extent by the depth of the soil, notwithstanding the absence of water in the river.

285 Redirect examination.

By Mr. ASHBAUGH:

I didn't mean that it does not make any difference whether it has water or not.

There were no large cities here when I came to this country. We have plenty of railroads now.

286 There was a difference in the value of the uplands and the bottom lands when I came here, because of the underflow. If the underflow should be permanently removed from the bottom lands, there would be no practical difference between the uplands and bottom lands.

Packing houses, railroads, the increased population in Sedgwick county, all such things have affected the price of land in this valley.

287 I thought that the instituting of a suit because of the taking of water was too large an undertaking for one individual to prosecute, and that the proper party was the State of Kansas.

289 (Complainant's Exhibit A–4 introduced in evidence.)

290 CHARLES E. MCADAMS, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Wichita, Kansas, since 1873, continuously, and am a practicing physician. During the early years I had occasion to give attention to experiments made by the board of health in the city of Wichita, concerning the location of the water works.
291 I was a member of the city council and of a committee on health. This health committee was appointed by the city council. I had occasion to make experiments and observations concerning the underflow of the Arkansas river through the city of Wichita. I can't give the year, but I think it was in 1882. I was chairman of that committee, and we had instructions from
292 the city council to make the necessary inquiries in regard to locating the water works and finding the best possible place to get the water for the city. We drove wells in different parts of the city to different depths and took samples of water from different depths for analytical examination. This occupied several months.

In driving these wells I discovered that the depth of the sand with the water in it beneath the city was a uniform depth of 36 feet. In driving these wells we went through from five to seven dif-
293 ferent layers of what was called hardpan, of a marl formation. We found water any where within twelve feet and often times less than that, but it was not fit to use.

I performed some experiments on the lot where this post office building now stands to determine whether the first water had a flow. I can't remember the exact year, but it was near 1882.
294 These lots are about 250 feet east of Main street and about 250 feet south of Douglas avenue. We had no water works and all the water was pumped out of the ground. We drove these wells on these lots to get the flow from some privy vaults and cesspools on the east side of Main street. I had an idea that the water flowed to the southeast. I drove five wells on this lot. Four of them were at the corners of a twenty-foot square, and the
295 fifth one in the center. I drove these wells sixteen feet deep, all the same depth. The men pumped the water out of them all so that the water was clear, and I unscrewed the stock from the middle well and suspended one-half ounce of red aniline in a cheese cloth, with a weight enclosed in it and a string tied to it so that it would sink properly, and measured the depth from the top of the stock to the center of the perforated point of that tube, and I suspended this red aniline in the center of the pump so that it would be in the center of the perforated tube. I had a man at each of the four pumps. I took a note of the time with my watch from the time the aniline was suspended in this pump, and had parties watching each one of the pumps that was working, pumping the water. These pumps pumped just alike. They were the same size and the same depth. The colored water from the red aniline appeared at the southeast pump first, and if I remember right I think it took a minute and a quarter before the red water appeared at the southeast pump. It appeared next in the southwestern pump. I think there was over half a minute difference in the red water appearing at the southeastern than it was at the
296 southwestern pump. The next red water appeared at the northeastern pump. The northwestern pump I don't think showed any red water if I remember. I kept these four pumps going at the same rapidity for I think two hours. As I remember it, no red water appeared at the northwestern pump, and it was several minutes in appearing at the northeastern pump. It showed that the water flowed from the northwest to the southeast about thirty-five degrees. The pump at the southeast corner showed the greatest amount of red water or the deepest color, and the next one in amount of color was at the southwest corner. I don't remember how deeply the water was colored at the northeast pump. It appeared at the southeast pump the quickest and the color there was the deepest.

297 Cross-examination.

By Mr. DAWSON:

The lot upon which the wells were sunk was four blocks east of the river, which would be about 1200 feet, plus the width of
298 the streets. The streets are from eighty to one hundred feet wide. I can't say in what time of the year I sunk those wells. I think it was in the fall. I don't know what the condition of the river was at the time. I think you could find water at a depth of nine feet, but I think the shortest pipe I drove and took sam-
301 ples of water was twelve feet.

The river runs directly west of the point where I sunk
302 those wells. It might have been three or four or five layers of hardpan that I went through in driving those wells. It was the same thing in each hole, the same number of layers of hardpan and the same thickness. Between the layers of hardpan the driving indicated that the formation was sand and in
303 the various layers of sand we would find water. I had a man at each pump. I had them pumping some time to get the water clear after the wells were driven. They worked these pumps perhaps half an hour before this coloring matter was put in. They all worked the same in pumping them clear. It riled up the water in getting these pumps down, and we pumped it to get it clear. Each pump was pumped the same time to get it clear. They were possibly not pumping the same all the while; one man might stop to get a drink and the other go on pumping, but we had a man at each pump. When I dropped the aniline into the center pipe
304 they were working the pumps, all the time. I told them to keep pumping those pumps, and I suppose they did. I don't think the men pumping worked by strokes so that they all worked with equal rapidity. I don't know anything about that. The pumps were the same; they were all new and of the same make. The men were different in physical strength and size; they were common laborers. I instructed them all to pump alike and I wanted to get the same flow of water, but whether they did
305 or not I don't remember. It is possible that if the water stood at the same level in each of these five holes at the time we commenced pumping and one pump was started shortly before the others or was a little better pump it would be likely to draw the coloring matter to that particular outlet quicker than to the others. I think this is probable. There was not much chance of lowering the water, as the pressure seemed to be uniform all
306 the while. I think the coloring matter went to these pumps from the subterranean flow. I was trying to determine by
307 this experiment about the flow of the water—in what direction it went. It was not flowing in three different directions, but it came out of holes in three different directions. Coloring matter dropped in water is likely to spread in all directions if it is undisturbed by any current or pressure in any direction. I thought

there was a well established current or underflow in the direction from the northwest to the southeast in this sand. I based that upon that experience with that coloring matter. That is the only experiment of the kind I have made.

308 As to whether or not there might have been an old channel of the river there at some time, I am notjable to state. I have an opinion, but that is not worth anything. My opinion is
309 that the river bed or channel used to be over here where Chisholm creek is, over near the bluffs.

310 I drove one well afterwards down 36 feet and took five quart samples of water out of that. The deeper I went the better the water was and the less it was impregnated by animal matter. The more of those layers of marl there were driven
311 through the better the water seemed to be under them. From those investigations I made, water works were finally established in the northwestern part of the city, I think about a mile and a half from where these experiments were made. It might not be that far; it may not be over a mile on an
312 air line. They drove their pipes down I think between thirty and thirty-six feet. I think they drove down a hundred or two hundred of those wells. The present water works I think are three or four hundred feet from the river, and about one-quarter of a mile from the Little river, and where those wells are sunk it is called an island. It is only an island when the water is pretty high. It is almost opposite the mouth of the Little river,
315 about a quarter of a mile from it. I think they went 36 feet there. The contaminated water I found the nearest to the surface where I put down those four wells was heavy loaded with material and it would naturally move less rapidly than that which is less contaminated. It was about nine feet down to this water. If you have a surface stream in which you discharge sewage the rapidity with which that stream will purify itself depends very largely on the current or the flow which the stream has, and if you would discharge sewage into an underground stream the quickness with which it purified itself would also depend somewhat on the
316 rapidity with which it moved through the gravel and soil. In case the underground waters are very strongly contaminated I do not think that would be a circumstance going to show that the water was moving little if any. I am of the opinion, from the demonstration I made, that this underground water where the wells were sunk moves.

317 Redirect examination.

By Mr. ASHBAUGH:

The sheets of hardpan spoken of were not connected with each other and the water from one stratum could get to another stratum. At the time these experiments were made the city had no sewage and all the imperfections from the cess-pools and vaults got into this

surface water. From my experience as a physician in this city, and having made these special observations, I should say that if the underflow should be materially lowered or destroyed it would
318 affect the health of the city. The present water works system furnishes purer water than the water furnished from wells in
319 the city. The present water works are not located where they were located in the first instance.

Recross-examination.

By Mr. DAWSON:

At the time I made my investigation and report to the city I advised the citizens of Wichita to drive their wells to a depth
320 of thirty-six feet uniformly all over the city. A great many did so. I presume some did not. I think the average distance from the surface to the first water in Wichita is about nine feet. That first water is not good for domestic purposes. The fact that the water level was lowered, from nine to twelve feet, would not have any effect upon the health of the community if the
321 amount of the subflow current was the same as before. I wouldn't think it would have very much effect.

322 JOHN W. SHIVE, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived near Burrton, in Harvey county, Kansas, since June, 1871. I own the northwest quarter of 20, 24–3. It is a sandy loam about the same as the bottom lands throughout the valley There are first and second bottom lands along the Arkansas river,
323 The first bottom lands on both sides of the river at Wichita are about seven miles wide. I am acquainted with the Arkansas valley from Wichita to Lakin, Kearney county. The Arkansas valley at my place, on both sides of the river, is
324 about fifteen miles wide. At Hutchinson and Sterling it is about eight miles wide. At Great Bend, including in some places second bottoms, it is about eight miles wide. Often the land for a mile wide along the river is lower than the other, which some would call first bottom. The valley is not quite so wide at Dodge City. The valley, including first and second bot-
325 toms, at Garden City, is six or eight miles wide, and at Lakin, about five or six miles. In most places between Wichita and Lakin there is not a well defined distinction between the very point where the first bottom lands end and the second bottom lands begin. In some places it goes up more abruptly and in some places there is a gradual ascent from first to second bottom. Some men might call first bottoms what others would call second bottoms.

(Objection.)

The first or second bottom lands extend back from the
326 river beyond the city of Burrton four or five miles. The city of Burrton is in what I term the first bottoms of the Arkansas river, the valley between the two rivers. The city of Burrton is eight miles from the Arkansas river.

I am well acquainted with the flow of the Arkansas river. The average depth of the flow of the river during the dry season of the year, excluding May, June and July, for the first fifteen years
327 that I knew it, I should say was from two to two and a half feet. The average flow of the river for the last ten years during the dry season of the year, excluding the same three months, is not so great. Sometimes there is no surface flow at all. I should say that for one-tenth of the year there was no river at all and that during the balance of the year, outside of those three months, the average was not more than six inches. For the first fifteen years that I knew the river, from Wichita to Hutchinson, I should think it was a thousand to twelve hundred feet wide on an average. The river has filled and in some places the banks have changed; they have filled on one side and have washed somewhat on the other. On an average, the banks are narrower from Wichita to Hutchinson than they were during the early years by at least one-third.

328 (Objection.)

These banks have become narrower by the bars not being covered with water and trees growing on the bars where they have usually been covered with water; then when the river gets up it will fill there and make accretions, and in that way it has narrowed the river. This has been by natural, not artificial, means. The bed of the river has filled and is higher than where it used to flow. On the sand bars there is a growth of grass, underbrush and timber from Wichita clear up to Hutchinson. There are islands there now covered with grass and trees that were not there thirty years
329 ago. There are quite a number of those islands and they exist up the river beyond Hutchinson so far as I know. The bed of the river will not permit so much water to pass, and it is more liable to overflow, and with the same amount of water the overflow is greater than formerly.

(Objection).

330 The flood of July, 1904, was caused by the greatest rainfall I ever saw.

Just north of me is the Kissaway creek; it is the main outlet for the surface water. It is mainly a slough until it gets near the Little river, and then it becomes a permanent stream. For the
331 country north of me in an excessive rain the natural outlet would be the Little river; south the Big river. This excessive rainfall of July, 1904, affected both the Big and the Little rivers.

The narrowing of the channel and the filling up of the bed of

the Big river did affect the common outlet for those waters. The channel of the Big river has been narrowed through the city of Wichita within my recollection. The bridge at Douglas avenue in
Wichita, as shown in Complainant's Exhibit A–1, used to
332 have eight spans in it. It is narrower now by about one-third.

In the counties of Sedgwick and Reno, and for some distance further up, the principal crop along the immediate river is corn, and further out we raise corn, wheat, oats and alfalfa principally, and from there up they raise more wheat and alfalfa. In Kearney county the crop is principally alfalfa. The practical limit for corn is about Kinsley or this side of Kinsley, and west from Kinsley corn
is not considered one of their regular crops.

333 I am acquainted with what is known as the underflow. I mean that this valley—the whole of the valley—is underlaid by a stratum of water that flows parallel or very nearly so with the river. This underflow where I live extends clear across the valley, and so far as my experience, knowledge and information go it extends back to the bluffs on either side. It extends up the river in the same way. Within the years of my information and experience the underflow has lowered between three and four feet at my place. When I first came to the country I often dug surface wells and dug into the ground for other purposes, and the water then was nearer the surface than it is now or has been since. When I dig into the ground now to the water I find it about three and a half feet furtherr down at the same point than it used to be during the
same season of the year. The current of this underflow is
334 parallel with the flow of the river or nearly so. The surface of the underflow is level with the surface of the flow of the river, or we always supposed the surface of the water throughout the valley, as measuring to the river, parallel, is on a level, and that is the fact. The water in my wells, rises and falls with the rise and fall of the river. It does this as far back as to the city of Burrton. I am acquainted with the Santa Fe well in the city of Burrton and saw it when they dug it. It was dug to furnish water for engines on the Santa Fe railroad. The water in that well rises and falls correspondingly with the rise and fall of the Arkansas river. The underflow through all that country has a current in a southeast direction. This condition extends up and down the river as far
335 as I know. The Little Arkansas flows into the Arkansas river at Wichita. Below that is the Chisholm creek, the Cowskin, the Ninnescah; and the Walnut which enters the Arkansas river at Arkansas City near the State line.

The lowering of the underflow has affected the crops in this valley. We used to have more of what we term sub-irrigation. Our underflow was near the surface. Then we were certain to raise
corn, or almost certain, but since the water has receded we are
336 then affected by drought and the soil does not gain its moisture from below as it used to. This has affected the crops in-

juriously and to the extent of one-third, I should say, of corn and such vegetation. In the early years we were not dependent upon rain for a corn crop, because the soil would gain its moisture from this underflow. It would gain sufficient to make fair corn crops with but very little rain. During the last few years it does not make a good crop of corn under the same conditions, and now we have to depend principally upon the rainfall, and to make a good crop it should be distributed throughout June, July and August. Amount of rain alone during the year will not make a good corn crop. The rain might come at a season as it did this spring or summer when it didn't make a crop; that is, at an inopportune time. In
337 order to raise a crop now we must have not only a sufficient amount of rain but it must be properly distributed. It has the same effect upon other crops that depend upon the underflow for their moisture; that is, all vegetation, all the gardens and fruits; and wheat and oats to some extent, but they are not grown much very near the river, but back. Not so much the case with wheat and oats. This same condition exists on up the valley. This change in the conditions of the valley became noticeable about the year 1890 to 1896, along there. It was after 1890 that I first observed that the conditions were getting much worse. My attention was first called to it by digging and finding that the surface water had receded; that is, as regarding the underflow; but you see I raised crops every year and I could tell from my crops; they would not grow as well under the same conditions as they did formerly;
338 and by digging wells I found this underflow had receded to some extent. Some others had observed it and it began to be common talk throughout the country to know why our crops didn't grow like they used to. The lowering of the amount of water, both in the flow of the river and the underflow, has lessened the productiveness of this valley, so far as my observation and information extend, to the amount of one-third. I mean that it still leaves two-thirds as much; that is, it wouldn't make more than two-thirds as much under the same conditions. This applies to alfalfa to a certain extent, but I think not so much as to corn. This condition has affected wheat and oats somewhat but not to as
339 great an extent as corn. This lack of moisture has affected all kinds of garden vegetables raised on the first bottoms as much if not more than corn. My answer as to the cause of this diminution would only be speculative and from common information, which is that Colorado is taking more water from the river, and that amount of water taken from the river lessens its flow in Kansas.

Cross-examination.

By Mr. DAWSON:

I have lived in the same place since 1871. I now have 960
340 acres of land, cultivated principally to corn, wheat, oats and I now have considerable alfalfa. Up to 1890 I raised princi-

pally corn and since 1890 I have diversified my crops more by raising wheat. From 1871 to 1890 I rotated the crops to a certain extent, but sometimes I would raise corn on the same land two or three years before I would rotate it. I didn't fertilize the land. The oldest land is in alfalfa. From a money standpoint there is not much difference in productiveness between alfalfa and corn. One cause of growing alfalfa was that my land was growing less productive in corn and we found alfalfa was well adapted to our
341 vicinity and added it as another paying crop. I have never had a failure of alfalfa on my lands after I once secured a good stand, not from natural causes, except this year. This year it got too much surface water. Land is better for alfalfa when it does not have too much surface water or the underground water is not too near the surface. The deeper the soil the better it is for alfalfa. Alfalfa will go down for water for fifteen or twenty feet after it once gets started, and it is better upon soil of that depth where it can find water at that depth than if the water comes too close to the surface of the ground. It does better on lands under which the waters lie deep than corn does, for that reason. It is rather speculative as to how far corn extends its roots into the ground. In dry seasons the roots will go much deeper than in wet seasons. I would say that a corn root—the main root,—will go down a foot and a half into the ground. My land is still productive in wheat. It has not lost its productiveness for wheat so much as for corn and other crops. The
342 newer lands I have put into wheat and grain and the older lands into alfalfa. The newer the land we consider the more certain we are to raise wheat. My lands are about four miles from the Arkansas river at the nearest point and nine miles from the Little river. I live in the delta or the angle between the two, in the valley extending from one river to the other.

The main channel of the river to-day I don't believe has filled up, what is left as channel, but I mean the parts that have filled have narrowed the channel. The channel is probably as deep in
343 the banks as it was formerly. I wish to be understood as saying that the part of the river bed which was formerly covered by water and which is now not covered has filled, but that the channel, which has water in it all the time, has not filled. When the river has been dry and no water running on the surface, it has not had the tendency to fill the bed of the river right in the
344 main channel. The filling up was by the overflow of the river carrying sediment into those places where the brush and timber and grass had grown. The river is narrowing and consequently will not carry as much water as it would in a wide channel. The primary cause is from its being dry; that is, these sands becoming dry which form a part of the bed and young trees and grass and shrubbery growing on them. Then the overflow when it did come would fill in among that growth and would cover a part of the river and permanently occupy it with its accretion. I think the bottom on which the river runs is about the same depth from the general sur-

face as it used to be formerly. In the first fifteen years of my acquaintance with the river June and July were the months usually of the highest water. It seldom came up in May. We
345 nearly always had what we called the June rise, and that would extend largely through the summer. Of late years we have very little rise at all, but when they have come it was about the same time of the year when we got the floods. As a rule I would say that the water comes a little earlier now. I should consider the shrinkage of the water in the river to be at least one-
346 half of the volume of water, in the fall months, all except the summer months. There probably has been more than that, taking the full year, but in the fall months especially it has been very low, but in the winter months it probably has held a better per cent. We usually have our wettest months here in June and July, and that is true practically all over the State of Kansas. As a rule these same two months have been the months of the highest normal flow of water in the river. I attribute the decrease to the fact that the water has been taken out above in ditches. I have not been in Colorado.

348 If the crop reports for the State of Kansas should show approximately the same falling off in productiveness per acre as the crops in the Smoky Hill, the Solomon and other rivers, it would not change my opinion as to the cause of my lands
349 being less productive in corn than formerly. As I understand it, our river here is different. We have an underflow here that we are talking about tha- I understand those rivers do not have, and the underflow is what affects us. I have never made any investigations as to the Smoky Hill or Solomon rivers to find whether or not there is any underflow or any underground water.

353 I know in a general way the width of the country that the Arkanses river drains in Kansas. It is pretty hard to tell how wide a country it drains because all of the southern part of the State here is drained by the Arkansas—the western part. The Cimarron goes into the Arkansas river. It does not strike it in this State. I would say that the drainage anyhow—the average width is one hundred miles. I would say that the cultivated lands in this drainage have doubled during the last ten years over what it
354 was the first fifteen years that I knew the river. The run-off of water is not as great from cultivated or ploughed lands as it is from native sod lands. The cultivation of lands would certainly retard the discharge, but as to whether the permanent discharge would be as great I can't say. It would retard it at the start; it wouldn't run off so fast nor so quick. The ploughed land absorbes and takes up water more rapidly than the sod land. The water does not evaporate as fast in the ploughed land.

355 The value of my land is from twenty to fifty dollars an acre. There has been a time when these values were higher on the average than at present; that was just a little bit ago.

Lands were more current. There has been no time prior to four years ago when land has been any higher than it has been for the last four years in my locality. In the main there has been a steady increase in farming lands in that section of the country. The increase of value was faster at some times than others. Sometimes it would be at a standstill as it is now, and then it would advance again from some cause. In the last five years the values have gone
356 up considerably. The increase has been about twenty-five per cent. in the last six years. This covers the bottom lands generally along the Arkansas river, and there has been a corresponding increase in second bottom lands or uplands. In some instances grazing lands have advanced more than farming lands in that time. The growing scarcity of grazing lands I presume has been the cause. Since 1890 we have never had a total failure of crops. From the year 1890 we have had several short years, but I don't remember just which ones in the 90's. They have nearly all been short, and the years 1901 and 1903 were both short in my section. They were years of scarcity of rain. The year 1902
357 was better than some other years. The best corn crop we ever raised was in 1875. Up to the present time 1889 was the
358 best year after that, I believe. I am only speaking from memory, you know, and you know that running back through the period I remember some of the best years and some of the poorest but to say which is the best, positively, I can't do it. After the year 1890 our crops seemed to be poorer than they were before that, and much so, taking an average of ten years, say from 1880 to 1890, crops in my vicinity were better than they were from 1890 to 1900. Now, those statistics in the agricultural reports are never correct. They are taken largely from local reports. Last year we had where I lived the driest year we ever had. Now, I go over the State and I find every year there has been locally good crops somewhere, and poor crops, and for me to go all over this State and say what has been in Kansas according to those statistics, I can't do it. When I speak of statistics I mean those made
359 up by the State of Kansas and the Government of the United States. I don't remember the kind of corn crop raised in my section in 1880, but along about that time we had good, average crops every year in our valley. The corn crop in the year 1880 was not the worst one that we ever had in our locality. The Kissaway creek
360 is three and a half miles from the nearest point to my farm. The main river is four miles. This creek never has water in it except in wet weather. It empties into the Little Arkansas river. The Little Arkansas river is a constantly flowing stream and it empties into the main Arkansas river right in Wichita. I said the underflow from the main river extends across my place to the
361 Little river. The underflow from the Little river does not extend across my place to the Big river. It could not at that point extend across because it would have to run up hill. I know the Little river is lower at that point, and yet it runs into the Big

river lower down. I struck levels there with crude instruments, and the fall is greater toward the Little river than it is toward the Big river, that is, taking it at the same angle, and the outlet for the water on my place is to the Kissaway and the Little river. There are little springs along west or northwest of the Little river where the water comes out. I don't know of any on the other side of the Little river.

362 It has been nearly two years since I sunk the last well at my place so that I could test it. I have sunk wells since. I had to go nine feet for water. It was three feet deeper at that point than during the earlier years. As to the current of the water in the ground, I have found that the water in dug wells and other places in clearing would clear from one side of the well, and it would soon float off to the other side and the side it would clear from invariably was the northwest towards the southeast. From this I became convinced that this water was moving in the same direction with the river. The water that is furnished to this underflow at

363 my place evidently comes from farther west and flows for some distance under the ground and keeps the direction of the river at that point. I would think it comes from as far west as Colorado, some where up there. It comes from that direction. It extends up that way. I couldn't say just at what point it would leave the river, and as to whether it took the underground rock after it had been distributed on the soil for irrigation I am not prepared to say, but wherever you find it it is moving parallel with the river. The wells in which I have observed the rise and fall of the water are about four miles from the river. I have never made any observations that would indicate how long it took the well to show the rise after the river came up or how long it took it to go

364 down after the river had subsided. I know it doesn't take it a week at my place. I figure this water before it

365 reaches my well after leaving this river has to go probably ten or twelve miles. If it came directly east it would have to come about nine miles. It is my judgment that it gains access to the underflow west of me and then comes down and flows in a direction nearly parallel to the river. As to the limit of time in which this rise shows itself in my well, I

366 should fix it at two or three days. In putting down wells I always put my points down a good depth below into the

367 ground and have never been able to pump any of the wells dry. I don't think there has been any falling off in the average flow of the Little Arkansas river during the last 25 or 30 years, and no narrowing of the channel. I don't know which flooded Wichita this year—the Big or the Little river. The narrowing of the channel, at the bridge at Wichita has been artificial, for about

368 three hundred feet, by the filling in of land on each side of the channel. The river of late years has not overflowed the bottom lands in my vicinity as much as it used to. There is not the volume of water coming down that used to by any means, and

consequently it has not been as liable for the last ten years as before that to get up on the low bottom. If the same volume of water came down we would be much more liable to be damaged, but the way the water has come we would not be more liable. I have no objection to your holding back the flood waters in Colorado. If they just keep that it will be all right.

It is something over three years since I have been taking an active interest in this matter. I was a delegate from Harvey county
369 in 1901 to a meeting which was held to discuss this matter here in Wichita. I was appointed on a committee to go to Topeka and ask the legislature to give the appropriation. I went to Topeka and succeeded in getting the appropriation. I can't say it was because of my going, but anyhow the legislature made a small appropriation to investigate this matter and probably to bring this suit.

It has been probably twelve years since it was first brought to our notice that the people of Colorado were appropriating and diverting the waters of the Arkansas river. But the fact that our waters began to recede brought it to our minds and then the investigation was the way we arrived at the fact that Colorado was the cause. I have known of that fact ten or twelve years. It began about
370 twelve—well, ten years ago, probably. I didn't make any investigation in western Kansas to ascertain whether the underflow of the river was being taken up and diverted in ditches there. I don't know that they have ditches in western Kansas. I have heard that there were companies that were intending to make ditches for the express purpose of tapping the underflow. Just hearsay, not to my knowledge. I did not commence any sort of proceeding or suit at any time to stop or prevent the construction of ditches either in Colorado or western Kansas, and so far as I know my neighbors did not. I have never made any investigation of the the subject of wells sunk in western Kansas for the purpose of pumping water to be used in the irrigation of lands, nor in Colorado. I have heard that some wells were being so used in western Kansas, and have read some reports from the State where the State
371 was using wells, but I don't believe any of them were near the river. I never made any protest against this.

The knowledge I have of the river and its few tributaries in this State would lead me to believe that most of the flood water came from Colorado. I have no actual knowledge as to the fact, nothing only I have seen the river when it was full within thirty or forty miles of the State line, and the river seemed to be coming with as much water up there as it did down here. This was at Lakin. Probably it was over 40 miles. I have no knowledge as to how much water that may cross the State line from Colorado into Kansas is lost before it arrives at Burrton or Wichita. We often hear of risings up as far as Dodge City and up there that are coming down. They diminish somewhat, always, of course, in coming down, but it takes several days for the water to get down.

372 I have no personal knowledge of a dam in the Little Arkansas river, either within the limits of Wichita or immediately adjoining the city, which was blown out for the purpose of letting the flood waters in the Little river go down the channel. I have heard them say in Wichita that they had blown the dam out to let the—I have never seen the dam. I have seen where the water was dammed from it.

Redirect examination.

By Mr. ASHBAUGH:

When I spoke of one-half of the river disappearing I meant one-half in cubic feet.

373 The experiment wells out in the west end of Kansas which were dug by the State and its agency I think were not near the river, but were put out on the high grounds to demonstrate at what depth and what amount of water could be gotten. These wells were put down to test what advantage they would be for irrigation and stock.

R. E. LAWRENCE, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

375 I have lived in or near the city of Wichita since May, 1870. In May, 1870, I located my homestead one-half mile west of the Douglas Avenue bridge. It is the property now used for the Masonic home. I proved that land up in June, 1871, I think. It is the northeast quarter of 30, 27–1, east. West Wichita was
376 not then laid out. The post office had been established in Wichita a short time previous. Wichita then was a place of probably a dozen houses, not more than that. I lived on the west side of the river until 1886, and since then on the east side. In those early years I crossed the river nearly every day, sometimes two or three times a day. The post office is on the east side of the river. I am acquainted with the Arkansas River valley pretty
377 well from Arkansas City to Hutchinson. Where the Ninnescah river approaches the Arkansas river the valley extends from one river to the other, and where a stream empties into the river the valley widens out so that the valley will vary perhaps from seven or eight miles to twenty miles wide. The character of the land along the river is nearly all similar. It is a sandy loam and very fertile. It is known as first or second bottom land, but often you can hardly distinguish between them. The land slopes gradually until you reach the bluffs outside of the valley. You can distinguish when you get back to the bluffs. Back of the bluffs the land is rolling and of a different soil and a different quality of subsoil. The valley a few miles below Wichita is about seven or eight

miles wide. At Wichita from one bluff to the other it is
378 about seven or eight miles. Above Wichita the valley will extend from Little river to the Big river and some distance on each side, but as you get away from the Little River valley it will narrow up again as you approach Hutchinson. The Little river rises I think in McPherson and Rice counties. Cow creek is a considerable stream and empties in near Hutchinson. Chisholm creek empties into the Arkansas river just below Wichita a few miles, and Cowskin about twelve or fourteen miles. The Ninnescah empties in below that and the Walnut at Arkansas City. These are practically all of the rivers that enter the Arkansas river that have a continuous flow below the city of Sterling. The valley on an average from Wichita to Hutchinson will vary from seven or eight miles to
twenty-five miles in width. It will perhaps average fifteen
379 miles. It is very productive land.

So far as this portion of the State of Kansas is concerned, the first settlements were at Wichita. When I came here there were not more than fifty white men here. There were many Indians here at that time. The Osage Indians were here. The old Santa Fe trail ran from Leavenworth to Santa Fe through this part of the country and struck the river some where west of Valley Center.

The Chisholm cattle trail was laid out after I camped here.
380 It crossed the Arkasas river at Wichita and crossed my quarter section of land across the river. It crossed the Arkansas river just below the Douglas Avenue bridge which is shown in Complainant's Exhibit A–1. After Douglas avenue began to settle up they moved this trail so that it crossed the river about two miles south of Wichita. This trail went through Wichita up to Leavenworth.

When I came here we always had to ford the river, but during the spring of 1870 there was a ferry established right near where the
Douglas Avenue bridge is now. That ferry was used during
381 the high water until the completion of the bridge, which was built in the winter of 1871–2. That is the bridge shown in Exhibit A–1. During the periods of low water we always had to ford it. From 1870 to 1872 we either crossed the river on a ferry or forded it. There was then a good part of the year that we could not ford it except on horseback and swimming. We frequently did that but during the high water the water would be so high we couldn't ford it on a wagon. The water would come into the wagon. I forded it many times during the first two years after I came here when the water did not come into the wagon. My father and his family came to Wichita in the fall of 1872. I remember very well
that they forded the river and that the water ran into the
382 wagon box. During those years there would be two or three months in a year we always had to ferry if we went over with a wagon, and then occasionally during the other nine months of the year the river would get so high that we would have to ferry, but I don't remember the time. This bridge was a toll bridge, and we had to pay fifty cents every time we crossed it. The river frequently

got so high that we were compelled to use the toll bridge and we would go over the bridge with a load and then we would go back through the river empty to save the toll. They always forded the cattle across the river at the Texas trail, and they would swim
383 them over if the river was high. When the Douglas Avenue bridge (Exhibit A–1) was built it was built 800 feet long. When they started the bridge they were going to build it a thousand feet long, but they shortened up the east end and it was only built eight hundred feet long. The bed of the river was that wide. The lumber for the bridge I think was hauled from Emporia. This first bridge was a wooden bridge, and the iron bridge was put in about 1879. The river bed at Wichita was considered rather a narrow place in the river. It was wider almost all the way, perhaps, than it was at Wichita. There was always more water in the river south of Wichita than north because the Little river empties in there.
384 The Little river flows continuously. I never saw it dry. During the first years I knew it the Arkansas river varied a good deal, even in the dry months, as we called them. Sometimes the water would get pretty low in the winter then, but it would usually cover the axles of the wagon. I don't know as I ever saw it when it would not in some part of the river come up to the axles. It is pretty difficult to give an average, because it was very much deeper in some places than in others. If you go to the sand bars it would be very shallow, but I would say it would average, if it was spread out, probably a foot deep, and a thousand feet wide. There was not near as much water above the mouth of the Little river as there was below. During the first fifteen years that I knew the river I should think the average flow above the mouth of the Little river during the nine months, excluding the high water period was perhaps eight or ten inches deep across the river, and as wide
385 as I have indicated. If some parts were very narrow other parts would be correspondingly deep. Some years there would be more water than others. Examining Exhibit A–1, I should not think that it showed either high or low water; it was just about medium. From the buildings on the west side I should say that picture was taken possibly in 1874. I have seen that picture
386 in the Wichita directory for the year 1878. The water as shown in Exhibit A–1, I should think was fully as much, perhaps a little more, than it would average, excluding extremely high water. Examining Exhibit A–3, I should think that the water, as shown, was about the average or low water, perhaps a little lower, because there is a little more of a sand bar there than there is usually in the river. There are six courses of stone in the abutment as shown in Exhibit A–3. That is a picture of the bridge
387 that is across the river now. During the flood of 1904 the highest water, as I remember it, came up within about two feet from the bridge; perhaps a little more than that. The average flow of the river during the last ten years, during the dry seasons of the year, excluding May, June and July, was very much lower than

it was formerly. I should judge there was not more than one-half of the water during the dry seasons of the year—half as much in the river at one time as there was then. Of course it does not run as fast. The river is just about half as wide as it was when I first came here. It may have narrowed here at Wichita more than it has above, but I presume the river is about two-thirds as
388 wide as it was formerly from here to Hutchinson, and below Wichita it is about the same.

I remember the fact that certain appropriations were made by the Government to clean out the river. I don't remember the year. Possibly later than 1873. I have seen them dredging the river. I think every Congress made appropriations for six or eight or ten years. The dredging was done between here and Arkansas City by the Government. They would take their dredges and dig out the channel of the river and remove trees or logs or stumps if there were any, and try to get a channel in the river. In some places they would put jetties in in order to deepen the channel. This continued I should think possibly ten years. It was for the pur-
389 pose of making the river navigable, and was so considered at that time. I don't remember under whose supervision the work was done. There were some piles driven on the west side of the river, but I don't remember who drove them. Ackerman's island, in 1870, at low water, I should judge was possibly four or five or six acres. In Exhibit A–3 I think I can see it under the bridge. Examining Exhibit A–1 I don't see any traces at all
390 of Ackerman's island. Ackerman's island now has grown to be, I should judge, forty or fifty acres. I think he claims eighty acres. When the river is low Ackerman's island is a great deal larger than when it is high. When the river is low there would possibly be 80 acres in it, and when the river is high possibly not over 40 or 50 acres. I have been acquainted with the flow of the Little Arkansas river for the last 34 years. Its flow is uniform and has not decreased any I am sure. It may have increased
391 a little, but I think it has not very much. The supply of water from the river is from surface water, fed by springs I presume and the drainage and the local rains. I was here in July and I think the most of the flood originated in the Little river, and that it all originated perhaps within a hundred miles from Wichita. Both of the rivers were high. I think the Little river was higher than the Big river. The Big river was not as high as it was in 1877. There have been here two extreme floods—one in 1877 and one in 1904. There were two causes for the origin of the flood of 1877. We had excessive rains and we had excessive high water from
392 the mountains in the Big river, and the two things came together. In 1904 I think there was but very little extra water came down from the mountains. In low water the water is very unequally distributed over the bed of the river between Wichita and Hutchinson. There will be a continual number of sand bars, and shallow water, and in places deep water, but

usually there is a deep current somewhere in the river. It may be one side part of the time and the other side part of the time. The sides of the river, too, have filled up. It has narrowed up and the bed has filled up with islands. There are more islands than formerly. These islands consist of sand bars and some vegetation and occasionally trees. There are some trees on the islands. The outlet for excessive waters in the river below the mouth of the Little Arkansas is not as good now as it was when I came here. It has decreased one-third, and through Wichita the river is only about one-half as wide as it was when I came here. Here in Wichita there has been artificial filling up of the banks along the river at places.

393 This extended up and down the river about half or three-quarters of a mile possibly, but does not extend above the mouth of the Little river. The Little river flows into the Big river between Second and Third streets in Wichita, which are the second and third streets north of Douglas avenue, which runs east and west. I suppose that some of that flood of 1904 could have been forced across and through the city of Wichita by the fact of the river having been narrower at Douglas avenue. I think if the river had not been nammowed the water would have gone down a little more rapidly than it did. There would have been a better

394 outlet. If the river had remained as it was when I knew it first the flood could not have been bad, and in my judgment it would have been a good deal less at any rate; possibly not any. You couldn't tell. There would have been a better outlet for it. The only way that I can determine surely when the decrease in the flow of the river became manifest would be in regard to the abutments of this bridge. I know we never saw the foundations of those abutments until about the year 1890. I have seen them since very often, and they can be seen today. I saw them today or the day before. The foundation above the piling is six inches, and I could see the piling about eight or ten inches, and the stone abutments rested upon that foundation. The platform is upon the piling, and these pilings are out of the water now about six or eight inches. When the foundation at that bridge was put in they drove the piling down below low water mark at a very dry time; then they built the dams around and sawed them off below low water

395 mark and put this platform on, so that I never saw that platform or the top of that platform that the stone were built on before the year 1890. When the old wooden bridge was made there was not stone abutments under it; there were iron tubes, and they were put down on this same platform to support the wooden bridge. They were put on the same platform that these stone abutments or piers were built on afterwards.

Just below the bridge within the last few years a great many car and train loads of sand have been taken out. Sometimes a train load will be pumped out within a day.

I am familiar with the crops raised through this valley. I was familiar with them most of the time of my life until about the year

1890. In the year 1870 we didn't raise anything except sod corn; that was the first year it was cultivated here. This valley was settled from Arkansas City to Hutchinson in 1870, 1871 and 1872, and I suppose that the bottom lands were all taken during that time. The bottom lands were taken first. The first land that was taken around here was where the town site of Wichita is now.

396 I think that was in the winter of 1869 and 1870. The crops we raised for the next few years after 1870 were mostly corn. We did not raise much wheat until after the railroad came in here. We could always get a corn crop. The rain of course would help the corn, but the corn would do fairly well without very much rain because of the moisture in the ground and the proximity of water to the surface of the soil. On my homestead the distance to water would depend upon the condition of the river. When the river was up bank full I would not have to go more than three or four feet. When the water in the river was practically as shown in Exhibit A-1, on my homestead, I should think it would be four or five feet to water. It would depend upon the locality of places on the

397 land; some places would be higher than others. I dug surface wells over there. There was evidence of an underflow there. Yes, there was an underflow under all that land. There was an underflow under all this land in the bottom of the Arkansas river which I have described.

(Objection.)

The direction of the current of that underflow was parallel with the river—south over there at my place. Since about 1890 I have had a good deal of experience in digging cisterns and cellars and places like that, and I know the underflow is a good deal deeper that it was formerly; that is, we have to go further to get the underflow by several feet—probably four feet. When Wichita was built

398 and they began building business blocks they couldn't put cellars under the business houses. They would strike quicksand. They couldn't dig cellars. Within the last ten or fifteen years they have built cellars under the buildings. They can go deeper now and still have a drier cellar than they could then. That is true all over the city and the valley.

I was here in 1883 and knew Dr. McAdams at that time, and remember reading about the experiments he described on the witness stand this morning. I didn't see them, but I know they were made. They were made for the purpose of locating water works.

The lessening of the underflow has injured the crops very

399 much. It caused the crops to dry up, when formerly there was plenty of moisture. The valley is as productive now as it was formerly when we get plenty of water. We don't get as much water now as we did then, but if we get plenty of rain we get good crops. To make a crop certain we must have rain and must have it distributed through the season until the crops mature.

Cross-examination.

By Mr. ROGERS:

I came here in the year 1870. Emporia was our nearest railroad then. That was the N. K. & T. The Santa Fe road had only built about half way from Topeka to Emporia. At that time this portion of the State was practically unsettled. The county of Sedgwick had already been established. I can only estimate the population,
400 but I suppose there were five or six hundred people in the county. I think there was very little land under cultivation. The Indians were cultivating some land up north of Wichita, and they had some of what we call old corn ground that year, but aside from that I think all the land cultivated that year was sod crops. Harvey county was a part of Sedgwick county then; that is, part of Harvey county was in Sedgwick. When I first came here I would go up the river a few miles perhaps, probably ten or twelve times a year, perhaps ten miles. We would go out on hunting
401 trips. There was no Hutchinson then; the town was not built. I think the Santa Fe reached Emporia at some time during the year 1870, and during 1870 and a part of 1871 we hauled our freight here from Emporia, and in a portion of 1871 we hauled it from Cottonwood Falls, and then from Florence and Newton. I think the Santa Fe railroad reached Hutchinson during the year 1872. This country was all settled up before the railroad came
402 here. From the time I came here the country from here westward began to settle up. Of course the bottom lands would settle first, and they didn't take up the uplands until they had exhausted the bottom lands. As I remember it, they begun to settle the uplands in 1873, perhaps some in 1872, but there was Government land on the uplands for probably six or seven years after I *h* came here. I cannot say
403 when the uplands west of Hutchinson were settled. When I came here I found a considerable body of water in the Arkansas river. I did not find any lessening of the amount of water from year to year up to 1880; it was just about the same in 1880 as it was in 1870, or practically the same. I don't think I noticed any lessening of the amount of water in the river from 1880 to 1890. I don't think I commenced to notice it until 1890 or a little after that. I mean to say that the water of the river in 1890 or the years about 1890 was practically the same as in 1870 and the years immediately following 1870. Whatever they may have done in the way of diverting water in Colorado prior to 1890, we didn't notice it here. They filled in about 200 feet at the Douglas Avenue bridge when the first bridge was built; that was in the winter of 1871 and
404 1872, I think. They filled in 200 feet on the east end of the bridge. They built an abutment out in order to save building 200 feet of bridge, and narrowed the river 200 feet at that time. They took off another span of the bridge, 100 feet, I should judge in 1884 or 1885. I can't give the exact year. They narrowed up

the river 200 feet when they first built the bridge, and then
405 they narrowed it up again another 100 feet. They next took off a span at the west end, I should judge it was about in 1887 or 1888. That was about the time we had the boom here. They took off one span, 100 feet, so that up to 1887 they narrowed the river 400 feet. Some time after that, several years, they took off another span on the east end. That must have been about 1890 or 1892 I should judge. That was 100 feet. Then they had taken out one-half of the river. At the time the last encroachment took place we thought the volume of the water in the river was less than it had been in the earlier years, and we began to think that we could encroach on the river a little. A good many of us have been very doubtful about this encroaching on the river, and a great many people want something done to get the channel where it should be.

The time the Government undertook to provide a channel and to deepen the channel for the purposes of navigation I should think
407 was from 1872 or 1873 up to as late as 1880 perhaps. I don't exactly remember the dates. They deepened the channel below the Douglas Avenue bridge, between here and Arkansas City. I think the effect was to make the water a little higher and a little deeper. It would naturally make it higher if the channel was narrowed up; it would have a tendency to raise the water. They simply lowered the channel of the stream by dredging. If the channel was simply deepened it would narrow the water and I think it would lower it. The effect of this constant narrowing of the river with the same quantity of water would make the channel
408 a little deeper and raise the surface a little. It would scour the river with the same amount of water. I would think that would raise the water level a little. I think it would only have this effect in high water; I don't think it would raise it in low water.

Below the Douglas Avenue bridge there has been a crude sand pump for a number of years—probably four or five years; but they have improved it and the one there now is a better one than they had at first. There are two or three there now—I think three. I
409 don't think these sand pumps are deepening the river bed. I think it fills up with sand about as fast as they take it out. I presume some days they take out possibly ten or twelve carloads. They move the sand pumps up and down the river
410 for a distance of half a mile. I think there was very little difference in the volume of water between 1870 and 1880 as compared with the volume between 1880 and 1890, in the winter. The winter flow continued about the same from 1870 to 1890. Of course some winters there would be more water than others, but it didn't vary very much. There was not so very much difference in the winter between 1890 and 1898 as compared with the former years. There was some difference I think. It was some less, I think. Where I noticed the river it was always below the mouth of the Little river. We could tell which water came from each river be-

cause there was a very perceptible difference in the color of
411 the water. In the winter months there would be some water from both rivers, but I think there would be more water from the Little river in the winter than from the Big river. I think there was quite a little less water in the Big river above the junction at the Seneca Street bridge after 1890 to 1892 or 1893 than there was before that time. The reason I stop at 1892 or 1893
412 is because it began to grow less. We didn't notice it very much until 1892 or 1893. It continued to diminish up to 1898. During the winter period there would not be so very much difference. In my judgment the diminution between 1890 and 1898 as compared with the former flow during the winter period would be ten to twenty per cent. less. I don't remember the condition of the river particularly in 1893. The Big river has been practically dry every year above the Thirteenth Street bridge across the Big river at some time during the fall and winter. I don't think the river was dry in 1874. There was probably standing water. There was very little running water perhaps. I never saw the river
413 dry before the year 1890 above the Little river. In 1874 it was practically dry from here as far as Dodge City. I am speaking by reports; I don't know it from my own knowledge; but that was the general understanding. Prior to 1890 I have
414 seen years that I could cross the river with rubber boots. This occurred very seldom. I remember the year 1893; it was an exceedingly dry year; and I think the next year was a very wet year, when it was practically full the whole summer.

In the earlier years we didn't notice so much about the
415 rain then as we have since. We would get a crop whether it rained or not. I couldn't give the years, but I know there was probably one-third of the time that the crops would be very short on the upland between 1870 and 1880. From 1890 to 1900 I think the corn crops in this county on the upland generally have improved. They have improved on the upland during the years from 1890 to 1900, as compared with the years from 1870 to 1880. I ascribe that principally to cultivation. The crops are better. The same would be true as to the bottom lands.

416 I first went through the State of Colorado in 1887, I think, going to California. I just went through the State; I didn't stop there. I have studied the irrigation methods of Colorado somewhat. I was out there three years ago and spent the summer up about Boulder and Greeley and Denver and studied it somewhat then. That was my first knowledge of irrigation.

417 I am quite an advocate of deep cultivation, and intensive cultivation too. Under proper cultivation the bottom lands will produce just as much as they ever produced if they get as much water. With the amount of rainfall we have and proper cultivation they will not begin to produce as much as they formerly produced.

We call this sheet or ground water the underflow. We
418 know that the water does flow under the soil here, under the surface. The fall of the river here is about four feet to the

mile." The rule is that you have got to go to the surface of the river before you strike water, all over this valley. I am of the opinion that there is a sheet of water underlying all of this valley and that that sheet water moves forward. As to whether this movement forward is not simply a movement corresponding with the fall of the land, I will say that whenever the land falls correspondingly
419 with the river, it does. If you take miles in extent the botton land adjoining the river falls as the river falls, down toward the sea, but there will be places where it will be higher, but taking it in general now for ten miles, I suppose the fall of the land will be about the same as the fall of the river, just about. The land is really higher along the river than farther back, generally. I think I said in my direct examination that the fall in the depth of the water of the river, during the months to which my attention was called, in late years as compared to the earlier years, is about four feet at the
420 Douglas Avenue bridge. I have noticed it up, as I said, about the Thirteenth Street bridge, about two miles up the river. It is pretty hard to determine the fall and depth there. I know the water used to be from one to two feet deep, and now there isn't any. At times it falls below the bottom of the river, nearly every year, during times in the year. Of course the upper layer of sand in the river bottom would be dry. You could get water
421 by digging for it. I don't know how far you would go down; I never tried it. I presume you would have to dig one or two feet even in the bed of the river to get water at times, and when the river gets in that very low condition, the surrounding country, of course, is drained until the water level corresponds with the level in the river. The country fills up again when the river fills by the water rising above here. Of course it seeps out through the
422 sand. It comes from the river. I should think it would run out laterally from the river into the adjoining lands, until they get filled up; then it would run parallel with the river.

(The witness explains at this point that the two hundred feet that was filled in when the first bridge was built, near the Douglas Avenue bridge, was not filled in by the city but by private individuals and corporations.)

424 The citizens of this vicinity generally have taken an interest in the question as to whether Colorado was responsible for the decrease in the flow of the river. I have been interested in the same way but have not been present at any meetings at which the subject was discussed. It has been generally discussed in the public press.

The narrowing up of the river as it has taken place at the Douglas Avenue bridge was used as an excuse by the people that wanted to narrow up the river and make land along the bank of the
425 river. They said the river was getting smaller and they didn't need so much room for the river to flow and consequently they would fill in along the bank. This 200 feet was filled

in at this end before the bridge was built or as an approach to the bridge at the time of building the bridge. At the time the first bridge was commenced the width of the river was about one thousand feet. The bridge as constructed was eight hundred feet long. At times the river would flow the full width of the river, a thousand feet. That was only during periods of high water. During the ordinary periods, that is, outside of May, June and July, the bridge as then constructed
was as long as the flow of the river at that point was wide.
426 There was water practically all of the distance under the
bridge. There might have been sand bars in the river occasionally when the water was very low, but with the average flow of water it covered the river bed under the bridge. Following the construction of the bridge I often observed outside of the months of May, June and July, that there were sand bars in the river and that the current of the river shifted from one side to the other. We
could notice the changes in the current pretty well by ford-
427 ing. The water was sandy and muddy and you couldn't see
the bottom. As I recollect it now the first span must have been taken out of the bridge some where between 1888 and 1890. I hadn't thought of that yesterday. The first span, I think, was taken out about 1887. It was taken out because the river had been filled in the length of that span. The level of the river remained
about the same after the span was taken out. It might have
428 been higher in times of exceedingly high water; ordinarily
it didn't make any difference. The water way at that point was then about seven hundred feet. The next hundred feet I think was taken out in 1889, probably a little later than that. The taking out of the first and second spans I should say was three or four years apart. After the second span was taken out the water way was six hundred feet in width. After that I didn't notice any appreciable increase in the height of the ordinary flow of the water.
The third span I think was taken out in 1899 or 1900—pos-
429 sibly in 1898. This left the water-way five hundred feet
wide. I couldn't say that there was any appreciable increase in the height of the water except during the high water.

I think the agitation concerning the taking out of water in Colorado commenced about 1894. Before that time I don't think it had been noticed very generally, at least I hadn't thought very much about it.

430 I was crossing the bridge every few days at least and there
was nothing to suggest any decrease in the flow, so far as my observation went, not up to ten or twelve years ago, perhaps. I think that, leaving out of consideration the removal of the third span, all former encroachments upon the river were made without any reference whatever to any claim or belief that the water in the river had diminished during the ordinary season, although there were ojections by a great many people to the filling in of the bank

of the river and taking off spans of the bridge. That objection had no reference to the ordinary flow.

432 I never heard any other theory advanced as to the cause only that the water was being taken out. I don't recollect of any investigation as having been made of the country lying between here and Colorado to determine whether there are any local reasons peculiar to Kansas bringing about this condition. The cause of the complaint was the fall in the level of the water under the bottom lands along the river. I don't think they would have cared anything about the river if they had had the water under the land. We always felt that when the river was bank full it really

433 did make or cause more moisture in some way. What I meant to say was, we didn't care anything whether the river was navigable or whether there was a lot of water in it or not, particularly, only as it brought moisture in the land.

A great many have the theory that the water in the river had an influence on this locality. Formerly when the river was bank

434 full through the season we would frequently have showers and sometimes heavy showers along the river in the valley and they wouldn't have any on the upland. We don't notice that difference now as much as we did then. I have not examined the Government records as to rainfall to satisfy myself as to the correctness of that theory. It was mere observation.

As to the commencement of the underground flow of water I never understood that it commenced just at the Kansas State line.

435 It commenced, as we always understood, wherever there was a sand formation under the land, on both sides of the river. The theory here is that it extends up pretty well through the State. The theory is that the lands in this vicinity are supplied from the underflow as it comes from the country farther north and

436 west. It comes from the river. I presume it comes laterally at this point. My idea is that the underflow extends westward probably two hundred or two hundred and fifty miles and in width from eight to twenty-five miles.. I think the water flows under the land the same as it does in the river, only not so fast. I have never heard of any investigations to ascertain the rate of flow of this so-called underground channel

437 until Dr. McAdams gave his testimony yesterday. I had no idea of it myself, only I know the flow is not very rapid, because I have noticed in an open well I had that the trash and sediment would clear from the north side towards the south, but I couldn't tell how fast the flow was. There is very little drainage into the river from the bottom lands at this point. Along the river usually the land is higher than it is back a distance. I think that when the river goes down this water which underlies the adjoining country will then set towards the river. That would be my

438 theory, but I have never made any experiments to find out, and I don't know of anybody who has made experiments. I

439 know it goes down to the river. It would be my theory that as the river goes down the whole blanket of water along

the entire course of the river changes and runs in the direction of the river, and it is my theory that the reverse would be true, that the filling in of that sheet of water is produced by the water
441 turning off along the entire length of the river and running in there. I can't inform you as to any one, either a citizen or a person of supposed scientific skill, who has made any investigations of the phenomena connected with this underflow.
442 I cannot say that taking the water out of the river or lessening the elevation of the underlying sheet of water has
443 affected the public health. I can't see that it has made any difference.

When I came to this country there was no timber except along the river. There were places where there were groves along the river and little bunches of timber, but not very much. That condition prevailed from here to the Colorado State line. On the adjoining hills there was prairie grass. This on the uplands in some places where it had its full growth would be pretty nearly knee high and from that down. It was good grass and a good growth of grass all over the uplands.

I think they commenced to dig wells on the upland about 1871 and 1872. The depth at which they would find the water would vary considerably, from thirty to forty and sometimes fifty feet, and there are places where they have had to go more than that.
444 I don't think they have to go deeper for water on the uplands now than they did then. I think there is more water on the uplands now than there was in 1870 or 1875 and along there. I think the streams are running more than they were then. I think that wherever water can be found on the uplands, the level has risen and that the wells have more water in them than they had in the early days. That would be my judgment.

From the time I came here to the present time this whole country, bottom lands and uplands alike, has been gradually settled up, and from year to year more land has been cultivated. That I presume was true for twenty or twenty-five years, but the last ten years I don't know that it has increased very much. I think it was about all settled up ten or twelve years ago.
445 The trees grew without setting out. As soon as the prairie fires were stopped trees began to grow in all the low places and in the sloughs and branches, and wherever there was a little moist ground the cottonwoods would start up, and that is in part the reason why the timber has grown along the edge of the Arkansas river. In the former times they didn't grow there because the whole country was swept by fires. There is enough moisture to raise grass on the uplands. It wouldn't make as good hay as the bottom, but some years it would make pretty good hay. It depends
446 upon the rainfall. On the average I should think we did get pretty good hay crops, probably a ton to the acre.

I have never heard the theory advanced that the settlement of the country westward on the water-shed of the Arkansas river, the

cultivation of the lands and the growing of trees might have had some influence on the decreased flow of the water in the river in the months of August, September and later on, in this vicinity. That theory don't strike me as at all plausible.

447 My idea is that the yield of corn out of the valley in this county is increasing; that is, the yield per acre. Not the
449 amount, but the yield. I think that has been brought about by intensive cultivation, and I think we do have more rain-
450 fall on the upland than we did formerly. It seems to me so.

As to the selling price of lands, this is owing a great deal to the improvements on the land and the location of the land. Farms near Wichita have been sold as high as a hundred dollars an acre. They were sold this year. I remember one or two farms up between the rivers that sold last spring for one hundred dollars an acre; but generally where they are a little farther back from town,
451 and with fair improvements, bottom lands are worth at least fifty dollars an acre, with good, fair improvements. I expect it would be pretty difficult to buy a bottom farm within ten or fifteen miles of Wichita at less than fifty dollars an acre, with good, fair improvements. I think lands are rather advancing in value. That is true of all land. There is not so much difference in selling price between the bottom lands and the uplands since the flood of this year. In places they are not quite as desirable until they get over the effects of this high water. I should say that a bottom farm equally well located and with equal improvements would sell
452 for twenty-five per cent. more than the uplands. I bought a farm of bottom land this summer about five miles north of here. The Government surveys showed that on that land of one hundred and twenty-five acres there was about twenty-five acres of made land. I paid one hundred dollars for the land by the
453 Government survey and the other land was thrown in. Where land has been made by the river I don't think as a usual thing it has eaten away land at some other place. I don't know of any place where the river banks have washed away to any extent. The extreme width of the river as I found it when I came here was the width of the river which was required in flood periods. It would be bank full in flood periods and during the ordinary flow of the river there were a good deal of sand bars.

Redirect examination.

454 By Mr. ASHBAUGH:

The sand bars I just spoke of are every year very many more and larger. In examining Exhibit A–1, the land that was filled in was simply the approach to the bridge. We didn't consider the land worth anything then. In Exhibit A–1, where the man is shown standing was the eastern end of the ford. The first span, as
455 I recall it this morning, was taken out about 1888 or 1889. The second span was taken about two or three years later, and

the third span about 1899 or 1900. The filling up of the river at the Douglas Avenue bridge had nothing to do with the lowering of the water in the Arkansas river above the mouth of the Little river.

457 It is no theory about the underflow at all, and my theory was applied to the direction that this water would flow in
458 going from the river under the land during high water. Sometimes when I would go over from town to my place I would notice that the river would be full, and would notice that there was no rise perceptible in my open well, but perhaps the next morning the well would be full or pretty nearly full. I couldn't tell the exact time, but from night until morning the water would get into that well.

The water-works system at Wichita is a very large one.

459 When I spoke of this being a timbered country I think I said this county.

460 The land is not as valuable as it would be if the underflow was as it was during the first fifteen years that I knew this country. One reason why land has risen here during the last few years is on account of better improvements; another is that the markets are better and nearer. We have good shipping facilities, packing houses, manufactories, mills and railroads, and the
461 increase of population has taken away our products. This rise in the price of land has been in spite of its productiveness, for it certainly is not as productive as it was fifteen years ago, and is not as valuable, considering productiveness alone.

There have been several openings of territory south of us. The largest opening near Kansas was the Cherokee outlet, in 1893. It put a great deal more land on the market, and in another way, it took away the chance of anybody getting any more land. I
462 think the opening in Oklahoma and Texas, and the cultivation of lands in both of those States, has affected Kansas considerably. We don't have as much hot winds as we did before this was opened. Before this was opened for settlement it was all a grazing country and along in the summer there would be continual prairie fires down there.. The country would burn over in August and September and sometimes before that, and of course the prevailing winds in this locality are from the south and southwest, and the settling up of these countries and the raising of vegetation and the disappearance of prairie fires has had quite an effect upon
463 the climate in this part of Kansas. That is my judgment. There is more moisture and not as much hot and dry winds as formerly, and I think this would affect the timber and the rainfall somewhat. Since this opening the rainfall seems to be more uniform than it was before.

(Objection.)

During the early years the showers were liable to come
464 from almost any direction, but now they are more uniform.

I think this opening of the lands has had something to do
465 with the increased rainfall through the valley. Just west of Wichita the water drains more to the slough than to the river. The slough flows parallel with the river, and I should judge about three or four miles from it, and is about twenty-five or thirty miles long. There was a flat boat built here and loaded with wheat and taken down the river, I think clear to New Orleans. It might have been about 1880. I know of a good many boats being built to go down the river for pleasure and fishing trips, but that
466 is the only boat I ever knew that was loaded with merchandise. Well, I know of some Government boats were used for moving from place to place as they did formerly. I remem-
467 ber there was a boat started from here with steam power, and it had a whistle in it.

(Objection.)

468 Recross-examination.

By Mr. ROGERS:

I don't think that boat loaded with wheat ever got back. I haven't heard that whistle since, nor any, in the last twelve or fifteen years. I don't know of any large boats that came back. Of course small boats would row back. They only furnished transportation one way.

We had the boom here about 1886, 1887 and 1888.

469 I don't say that the Arkansas river at this point is a navigable stream for commercial purposes. I don't think it was ever
470 practicable to navigate the river at this point. We did hope at one time that by dredging the river that possibly it might be in certain seasons of the year, as far as Wichita. It was dredged by the Government, but no navigation took place after that. The dredging boat itself came up, and that was all. With all our efforts we didn't get navigation; we didn't have water enough. At the time we tried to make it navigable down through the country there were no railroads through Wichita. We had to go by wagons entirely and we thought we might get some improvement over wagon hauling. At that time it would have been of real value to navigate the river. Before the Government got through with dredging it out the water was gone.

Mr. Ashbaugh, at this point, on behalf of the complainant, offered in evidence so much of chapter 181 of the third session of the
471 Forty-fifth Congress of the bill approved March 3, 1879, found on page 366 of the 20th volume of the United States Statutes at Large as reads as follows:

"For improvement of Arkansas river between Fort Smith, Arkansas, and Wichita, Kansas, $20,000."

(Objection.)

Mr. Ashbaugh for the complainant further offered in evidence so much of chapter 211, section 2, 46th Congress, approved June 14, 1880 (21 U. S. Stat. 187) as reads as follows:

"Improvement of Arkansas river between Forth Smith, Arkansas, and Wichita, Kansas, continuing improvement, $15,000."

(Objection.)

Mr. Ashbaugh for the complainant further offered in evidence so much of chapter 136, third session, Forty-sixth Congress, approved March 3, 1881 (21 U. S. Stat. 477) as reads as follows:

"Improving Arkansas river between Fort Smith, Arkansas, and Wichita, Kansas, $24,000."

(Objection.)

Mr. Ashbaugh for the complainant further offered in evi-
472 dence so much of chapter 375, first session Forty-seventh Congress, approved March 2nd, 1882 (22 U. S. Stat. 205) as reads as follows:

"Improving Arkansas river, $35,000."

(Objection.)

Mr. Ashbaugh, for the complainant further offered in evidence chapter 97 of the Laws of Kansas, 1864, being an act entitled "An act declaring the Kansas, Republican, Smoky Hill, Solomon and Blue rivers not navigable and authorizing the bridging of the same."

Mr. Ashbaugh for the complainant further offered in evidence chapter 79 of the Laws of Kansas, 1864, entitled "An act to accept a grant of lands made to the State of Kansas by the Congress of the United States to aid in the construction of certain railroads and telegraphs in said State, and to apply the same to the construction of said roads and telegraphs."

473 Complainant's Exhibit A–5 was here offered in evidence.

(Objection.)

473 B. H. CAMPBELL, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Sedgwick county continuously since 1878. I went to Hutchinson in 1877 and came to Wichita in 1878,
474 and have lived ever since at Riverside park near the Arkansas river and between the Little river and the Big Arkansas river, about a mile above the junction of these rivers. I am 76 years old and was in the cattle business for a good many years before I came here and have been in that business ever since coming here. It covers all my western experience. My business is ranching, and breeding and growing cattle. I bought a farm about

three miles above Wichita on the banks of the Arkansas
475 river. Sometimes I had a very large number of cattle and sometimes very few. I was interested in the Capital Syndicate ranch that built the State house at Austin, Texas. I have owned from four to seven thousand head of cattle at one time. I have about two thousand now. I own a ranch in Clark and Meade counties. My farm above Wichita consists of four hundred and eighty acres, and the Arkansas river bounds it on the west for about a mile. It is between the Arkansas and the Little Arkansas
476 rivers, which are about a mile and a half apart at that place. I have handled cattle up and down the Arkansas river in the valley more or less for years and have been familiar with the Arkansas river and its flow for twenty-six years. My farm has furnished feeding yards for my cattle and I bought corn up and down the river. By the valley I mean the country between the foot hills or high lands, and I should say the valley was
477 about from eight to twenty miles wide. The soil in the valley is a dark, sandy loam. As to fertility I consider it more than an average of this western country and as good as the land in Illinois, Indiana or Ohio, on their rivers. The first level land along the bank of the river we call the first bottoms, and then there is a shoulder or bench rising to a higher table and we call that the second bottom. The first and second bottoms
478 we call the valley. The lands back of the valley are known as uplands. The Arkansas valley is devoted more to raising corn than anything else. Wheat is the next staple, then comes oats, rye, barley, millet, cane and kaffir corn. It is a vegetable raising country also. Gardens are of average fertility and productiveness. All up and down the valley the country is good for vegetables, but we bring our potatoes a good deal from Colorado because we get a better article.

In a general way I have been familiar with the flow of the
479 river since I have lived in this country. It is conjectural somewhat, for I did not measure it, but I have forded and crossed the river several times and driven herds of cattle across it and I should say that the average flow of the river during the dry season, excluding two or three months when there was a flood, has been from two to five feet lower during the last ten or twelve years than during the first fifteen years that I knew it. It varies a good deal in width, but I should say it was from eight hundred to twelve hundred feet wide. I should say six hundred feet would be a very narrow place in the river. In the latter years the waters have receded and the grass and trees have grown and narrowed the width of the bottom, and islands have increased in number and size in the river. The banks have narrowed I should think one-half since 1890. Islands are far more numerous. Sand bars would form and then of course the grasses would grow until they became islands. There are a great many now that did not exist twenty years ago,

and many that did exist are much larger now. It grew upon
480 us that we were losing our river, I think about 1890. During the last ten years there has been no average flow of the river above the confluence of the two rivers to my knowledge. We often have long stretches when it is entirely dry, so that you could walk with slippers across it and not wet your feet. Just west of my house where I live now, last summer and the summer before last it was entirely dry; there was not a drop of water there. That is about half or three-quarters of a mile above the junction of the two rivers. There is no practical flow of water any longer in the dry time. The river didn't dry up suddenly by any means, but it finally disappeared, and we have had no river. I think the pro-
481 ductiveness of the soil, of the first and second bottom lands has been very much impaired. The lessening of production is by want of humidity. Before that time we have believed that we had sub-irrigation. We raised big crops. It was a conviction gathered from years of experience. We got bigger crops than they did where they didn't have what we believed to be an underflow or sub-irrigation from that river.

(Objection).

This belief was based entirely upon observation and experience, not hearsay,—observation of the decrease in the productiveness of the land. This decrease I should say amounted to 33 per cent, say one-third, of the yield of corn. I have observed that more particularly. I had more interest in it. I don't think we get as much corn now as we did fifteen years ago by from thirty to thirty-five per cent., something like that. We seldom had a failure of
482 crops in the first years, and have had many since. We didn't depend upon the precipitation of water; we got it from the roots, we thought. We based the value of our lands upon it. The sub-irrigation was stronger nearer the river when the river carried its normal flow of water, and weakened as it went back. I should say its influence was ten miles on either side, and practically the whole valley was under the influence of that sub-irrigation. I think the underflow has gone entirely. The river being dry,
483 the conditions don't exist that did exist. I don't know how far it has gone; it has gone. I don't think it gets back into the river after our neighbors in Colorado use it. I meant to speak of them kindly. I don't think that the change has affected wheat. Our wheat doesn't require rainfall at the same time our corn does. I suppose it has affected the raising of wheat in the valley, but to what extent I couldn't give an opinion, as I have on the other. A good crop of corn in the early days was seventy-five bushels to the acre, sixty bushels commonly. I should say forty bushels is
484 as good a yield now as sixty bushels was twenty years ago.

485 Lands are more valuable now than in the early years, but they certainly produced more then than they do now. The

cultivation in the early days was not as good as now. We have improved in means of cultivation a good deal; we have better implements and more intelligent and educated farming during these last years. Land is higher in price now because of the general prosperity of the country, the general advancement in values,
486 facilities for transportation, the scarcity of the public domain, which is becoming exhausted and lands becoming scarce, the demand increasing and the supply decreasing. All that has contributed to the enhancement of farm lands. The proximity of markets to these lands is a part of the growth of the country, and the railroad facilities for carrying products. The proximity of the market has been very noticeable. We have had good markets and we have had good railroad facilities that carry our products to the markets for consumption. These markets and railroad facilities are all about us, all up and down the valley, all over the country. In later years they have increased very much. Cities near here are points of consumption to some extent. We consume quite a good deal here with our factories and packing houses and other institutions. That applies more to the vegetable market than anything else, because the excess always goes away and that makes the market. It is facilities for carrying it away that has really
487 brought the increased value of lands—and the markets. The price of lands has not been enhanced by the fact that the river has gone dry; the reverse is true; it depreciated the value of the land *per se*. The less productive the less value, of course.

488 Cross-examination.

By Mr. HAYT:

I located here about 26 years ago. I came to Hutchinson in 1877. The farm I have in Sedgwick county is about three and a half miles from Wichita. The town water works are a mile and a half below my house, south. They are very ample for the use of the town. They go down into the earth for their water. I don't think they take it from the river; they take it from an island
489 in the river. When I first came here the country about here was pretty well cultivated. There was very little grazing. The grazing had gone onto cheaper lands west, and they were farming this part of the country pretty extensively then, but there has been an increase, somewhat. I think the farther you go up the river it was less settled—less populated—and a less proportion of cultivated land at that time than now. I should think there has been a constant influx of farmers along the Arkansas valley from 1878 up to the present time, and more and more land brought under cultivation. There were not so many trees in the early days, particularly along the water courses. Many had been cut off, but latterly they have grown, since fires were prevented from running; the cottonwoods particularly have grown. It is a treeless country now, compare-

tively, except where trees have been planted. I don't think
490 there has been a very great increase in the timber along the river. The farmers have planted groves of catalpa trees and they have planted orchards and grown them successfully on the uplands. The increase on the uplands is more noticeable. It has been quite decided; and to some extent the number of acres under cultivation has been increased during the time I have been here. As to the effect of the increased growth of timber and the increase in cultivation, that is problematical, but a smooth, unbroken pasture of grass land will certainly shed off a little more water
491 than a ploughed field. As to the ground water described by the witnesses, I don't think that has disappeared. The water which I call the underflow or sub-irrigation that existed when the river ran the normal quantity of water within its banks has gone. We can get water here by digging wells deep enough. You can't keep us from having some water down here. It is not easy to answer how far in feet and inches the water was from the surface during those days prior to 1890, but it was within practical reach of the roots of plants. I suppose we all understand what capillary attraction is. Now, this water will saturate the soil beyond a
492 point where it enters the land. You understand that perfectly well, don't you? And that did moisten and fructify the soil and we raised better corn then than we do now. They tell me that alfalfa roots run down sixty feet, but I never dug one out as deep as that, and I don't believe it. Alfalfa goes to the water and you can't raise it without water. And so about corn roots; I don't know how far the go down for drink; but the soil was moistened, as we believed, and the more we thought of it and the more interest we had in it, the more we believed we had sub-irrigation from the Arkansas river when its banks were full or the flow was normal. I can't state the depth from the surface of the soil to the water level of the country. I am not trying very hard to state it, because I haven't measured it. I can't tell the distance. I can't give it in feet and inches. As to alfalfa roots extending into the ground, I said I
493 didn't believe they went sixty feet. There is no doubt they go further than corn roots. It is a deep-rooted plant, very. I never made any investigation in reference to the underflow, as to how far from the river it extended. It is all observation and practical experience in the use of land—observation in buy-
494 ing the crops and hearing farmers talk. I am sorry to say that the cultivation of the land to corn in this vicinity without rotation with other crops is practiced too much here. I am sorry to say that because it impairs the fertility of the land to raise continuously any one crop unless it should be a crop like alfalfa, which is a fertilizer itself. That may to some extent account for the decrease in the number of bushels of corn per acre. It is very slight, and it is no different or worse than it is all over the country. It doesn't apply to this sub-irrigated valley particularly by any means, so I couldn't look there for the reason for the change. In

my judgment, whenever corn or any other crop has grown for a number of years in succession—a great many years in succession—
it impairs the productiveness. I don't mean to say it ruins
495 the soil; it will stand a good deal of abuse. I have never made any observations or measurements nor talked with anybody about figures as to the amount of water in the river. These are my impressions, and will not be very far wrong. If I swim a horse I know how deep it takes to swim him. In the early years the water in the river always increased as the cold came on, but when you get into the very cold months that condition is not so marked. But when cold weather comes on it increases the flow in
these Western streams unlike anything in the East that I
496 know of. The flow in the month of March is usually strong;
that is, a good average normal flow—that is, before the
497 mountain snows would come down. We generally expected a June rise in the Arkansas river. I think I noticed the falling off in the river during the winter months as early as 1890, but I didn't notice the water in the winter time. Well, it was about 1889, 1890, 1891, etc., that we began to observe
the loss of the water, until we became satisfied that our water
498 was going—gone. I don't remember what year I first passed through Colorado; it was after 1878. I saw more of the ditches in the summer. I remember that year because I went across through Colorado looking for cattle and finally went to Utah and bought there, but I was about in Colorado in 1895 more than in previous years, and I have been back and forth through the State since and have seen ditches. My impression is that I knew they were irrigating in Colorado as early as 1890, but I am not sure now. I will not swear that I can fix the year. The first time I was in Colorado was somewhere about the year 1890.

Redirect examination.

By Mr. ASHBAUGH:

499 I know that up and down the river around my house
in going across there I have repeatedly seen the river en-
500 tirely dry. It was in the latter part, I should say, of August, and September, and during the maturing season of the year. The ditches that I saw in Colorado in 1895 were irrigating ditches, but to what extent there were irrigating ditches in Colorado I don't know now. I didn't measure them, swim them or jump them. I just saw where our water was going, that was all.

501 C. P. FULLINGTON, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Wichita for thirteen years, and prior to that lived in Kiowa county, Kansas, since 1881. From 1881 to 1899 I was in the cattle business exclusively; since that time I have been in the real estate and live stock brokerage largely, and farming also. My cattle business extended over southwestern Kansas from the Colorado line down to Edwards county. I had one location in Colorado and three in Kansas. The locations in Kansas were in Morton county, in Comanche county and Kiowa county, and another in Kiowa and Edwards counties. The location in Colorado was
502 on the Cimarron river. These locations were for the purpose of grazing and breeding cattle and feeding. Our herds from 1881 to 1884 averaged about ten thousand; from 1884 to 1889 about five thousand. From the Colorado line to Hutchinson I have known the Arkansas valley since 1881 by riding and camping and grazing along the valley, and in the last thirteen years I have travelled up and down the valley. I have handled from one hundred to one hundred and fifty quarters of land a year, buying and selling.
503 The Arkansas valley in Sedgwick county at some points is from fifteen to twenty miles wide, and in Reno county I should think about as wide as in Sedgwick county. In Barton county it would
504 average from five to fifteen miles wide; in Edwards county about the same. In Ford county it begins to narrow up; the bluffs come down pretty close. At the western line of Ford county in one place it is about three miles wide, and then it extends as you go down to ten or twelve miles. In Gray county it varies. I should say between the sand hills on the south and the bluffs on the north it is four to eight or ten miles wide. In Finney county it is anywhere from four to ten miles wide. My recollection is that in Kearney county it begins to narrow up quite considerably, but I think it would average about six miles. In Hamilton it
505 would average perhaps five miles, and near the State line I guess it would be about three or four miles wide. Just west of the State line it widens out and then narrows in a short distance in above until you get to about Lamar and there in that vicinity there is quite a change in the character of the valley. It seems to pinch in almost to the river. The soil there is a sort of graying brown sage brush soil. There is not much vegetation on it. I wouldn't call it an agricultural country. The sage brush in
506 some places extends right down to the bank. I don't think that any crops would grow upon that land without irrigation or abnormal precipitation or rainfall. I don't think, naturally and normally, there is precipitation enough along about Lamar to grow crops. I should consider that when you have gotten up the river

about the first county in the State of Colorado, you have gotten into the arid lands. The Arkansas valley in the State of Kansas is a sandy soil, varying from almost clear sand in the immediate vicinity of the river to a dark, sandy loam, and growing better as you come down the river. I have been acquainted with the Arkansas river from 1881 and my familiarity with the river would extend through the months of September, October and November more particularly. Our ranches were south, and that was the season of the year in which we drove our beeves and held to the river and crossed it back and forth, and during that time I would think
507 the nomral depth was from two to four or five feet. It would run any where from belly deep up to high up on the saddle skirts of an ordinary horse. This same depth would extend on down the river. At some points it would be deeper than others, owing to the width of the channel. The channel would vary in width, I should think, from five hundred to a thousand feet in Hamilton county, and about the same in Kearney
508 county, and about the same all the way down. The river, it seems to me, was wider up there than it is here at the crossing at Douglas avenue, during the last ten years, ex-
509 cluding the flood times. It its normal condition the average depth was very much less. We would go across frequently ankle deep on the horse, and many times I have seen it almost dry, except in washed places along the bank, so that we would have to drive up and down the stream at different points to get water for the cattle. The crops raised in the valley from the Oklahoma State line to the Colorado State line are corn, wheat, barley, alfalfa, kaffir corn, sorghum and all sorts of produce, vegetables and fruit. Corn is raised from Oklahoma up through and including Edwards county. Wheat is raised more or less all the way through; alfalfa all the way through. Garden stuff for market I
510 should say is raised not farther up than Edwards county. We have water underneath the surface, what we call sheet water, clear out through the valley. I don't know what the cause is but it is a fact in many places along the river the water is not as near the surface as formerly. I think this lowering of the water level under the land in the valley has affected some crops adversely, particularly crops that are not very deep-rooted, such as corn, possibly wheat, kaffir corn, and crops of that character.
511 There might be points where it would affect tree growth, fruits, etc., and produce. I don't believe it would be disastrous to alfalfa. It is a deeper rooted plant and will go down to the water. I think the roots of alfalfa would reach the water though it was down beyond the point where it would be of any advantage to the shallower rooted plant. We are practically out of the corn district when we reach Pawnee county.

512 Cross-examination.

By Mr. ROGERS:

I came to Kansas in 1881 and settled at a point south of Kinsley in what was then known as Comanche county. That county was not then as closely settled as it is now. It increased from 1884 to 1889 and 1890 quite considerably, and then it depopulated
513 and then it has increased again. Comanche county is not on the Arkansas river. In 1885 or 1886 the legislature changed the lines or established Kiowa county and that left me in Kiowa county. In 1881, in September, we started our herds west
514 and drove up west to the west line of the State. We had too many cattle on the range we then occupied and had to seek new pastures for part of them. All the country on the flats south of the river was an open range at that time. On the north side I think it was practically open back on the flats. I
515 think there was some settlement up in Ness and Hodgeman counties. I went up the river on the south side in September 1881 and found water flowing in the river along the entire course wherever we came in contact with it. Didn't make any use of the water except to water cattle. We crossed at Lakin. We
516 didn't cross our herd there at Lakin, we crossed our wagon and outfit. The town is on the north side. Other than that we didn't cross the river on that trip. We crossed it on horseback at Dodge, Cimarron and Lakin, but we kept our herd on the south side. In driving our cattle we didn't average more than seven miles a day. When we got to Cimarron we crossed the river; we
519 forded it and we forded it at the mouth of the Mulberry; that is below Dodge. My recollection is that at places the river would be perhaps twice as wide as at other places; that is, what I mean to say by that, the flat, level sand coming to the abruptly rising bank; and where it would be wider it would be shallower. In some instances it would cover the whole of the river bed where it had a shallow depth, and then in other places where it was narrower it would be deeper. We preferred those wider places, in watering our cattle, because of the ease in getting down to it. Where the river would be very wide it would not be sometimes over knee deep, and possibly from that to two feet, and where it narrowed up possibly it might be five feet deep, away up on the saddle skirts, up where it would wet a person. Where it was five feet deep the channel was usually narrow; that is, that part of it was deep.

520 I made a trip up the river again the next spring. That was probably the last of April, just preceding the spring round-up.
521 I made the trip by rail to Lakin and went right across the country. Then I was back on the river in September, 1882. I found the river then substantially the same as I had found it the previous year. I was there each succeeding year for years until

our railroad was built down below, and sometimes in crossing
522 the water would be deeper than at others. I was up again — 1883, 1884 and 1885.
523 There was no influx of settlers in western Kansas and Colorado until after 1884. I was conversant with the fact that
524 they were settling, but whether there was an increased rainfall or not I don't know. They made crops there, and they have ever since. I bought corn in Kiowa county, Kansas. I don't know anything about the crops west from Dodge. I didn't farm any up there. I don't think they ever raised any corn in that country; I never saw any. I received cattle at Cimarron during
525 the summer of 1894. We had no water at Cimarron to speak of. We had to scrape in the river bottom to get water for our cattle, and eventually had to remove them out. Perhaps we stayed there two months, and then had to pull out. I think we commenced there some time in August and pulled out about the first of October. I was along there in 1887 and 1888 and saw ditches being constructed in the counties of Gray, Finney and Kearney, for the purpose of taking out the water in the river. I saw them digging ditches, and some of them had been constructed. Some
526 of them were enormous canals. That Soule ditch I remember was quite an extensive one. It went down through Ford and Finney counties. I remember some little ditches on the south
527 side. There were other ditches on the north side, but I don't remember the names. The general statement as I remember it from the people in that country was that they were disappointed in the country—deceived in it—and that the flat lands out away from the bottom were not productive. Most of the people
528 out on the flats said it was no good, and pulled out.
The limit of the corn belt, going westward, would be diffi-
529 cult to establish. I bought good corn in Edwards, Pawnee, Stafford, Pratt and Kiowa counties. These are the farthest
530 west I have ever bought any for any considerable time. Since that time a good many authorities say that it is beyond the limit of the corn belt, that it does not extend west of Reno, perhaps, but I know that Stafford and northern Pratt and the west of Edwards have been good corn producing localities.

Of late years there have been a good deal of alfalfa on the bottom lands along the river which I travelled over in 1881 and
531 found but few settlements. The alfalfa planting has been very materially increased, in fact there didn't use to be much of it out there, if any. It has been very much increased in the last few years. Proportionately, there has been quite an increase in the land put under cultivation from Kinsley west; but as compared with this country or a country that is developed there has been only a comparatively small portion of it. I think that the profitable crop there is alfalfa; it is the only one that can reach water.
532 In speaking of the fall of the water I intended to say that a fall in the level of the water might be disastrous to certain

crops and yet would not be to others; that is, that the alfalfa, being a deeper rooted feeder, might reach it, where it would get entirely out of reach of the surface crops. I don't think the alfalfa crop has been benefitted. I think there might be cases where the water was at such a level that a further drop of four feet or any amount
533 would be disastrous or detrimental to the growth of alfalfa. I cannot conceive of any crops that would be benefitted unless the water was right on the surface.

Some of the lands in the western part of the State have increased in value. I can't name a locality where they have decreased. There are localities where there is some demand for land at a price where previously there was no demand at all, and then again there are localities where there is considerable land at a very much increased price. The net result is an increase in the value of the land.

534 I first went to Colorado in 1882. I have been through Colorado and down through El Paso.

Redirect examination.

By Mr. ASHBAUGH:

If the water were within a foot of the surface I would consider a fall of four feet beneficial; if it were at a greater depth and down to about the maximum point where the alfalfa would reach it, and reach it quickly and profitably, then I would consider it dentrimental.

(Objection.)

535 I would say that if the water was within a foot of the surface a fall of a couple of feet would be beneficial. There are no marshy lands along the river bank except in small spots, not enough to speak of in calling them in that way. I don't remember of sufficient marshy lands along the river to be noticeable years ago.

615 D. A. MCCANLESS, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Wichita, Kansas. I first came here in 1869, and in 1879 I removed to Medicine Lodge, returned to Wichita in 1887, and have lived here ever since. I was the first settler in West
616 Wichita, on the west side of the river. I established a post office there by the name of Delano. That was about 1870. I did business in West Wichita from 1870 to 1879. During those years I had a store on each side of the river and crossed the river several times during the day. Sometimes I forded it, swam it, and

part of the time there was a ferry that took you about half
617 way across and landed you in a shallow place near where Second street now is. The ferry was established in 1871 and run until the bridge was completed in 1872. Complain-
618 ant's Exhibit A–1 is a picture of that bridge. That bridge was there when I left in 1879. It was a private bridge. The ferry might have done some business after the bridge was established owing to the high price of the toll, and very exorbitant fees were charged. After the bridge was built some people forded the river at low water. It was often the case that people crossed the bridge with a heavy load and then forded the river in coming back with an empty wagon.

Since I returned to Wichita in 1887 I quit the mercantile business and have been engaged in the practice of law. I have been prosecuting attorney, probate judge, *pro tem* district judge of this county, and president of the board of police commissioners.

I have had such an acquaintance with the Arkansas valley through the county as a man would acquire by frequent visits over the county and being interested in various kinds of business. I
619 was just as familiar with the river as it was possible, almost, for a man to be who didn't live on the river, for I had to cross the river to go to the bank, post office and everything else, after we discontinued our post office over there. I should think that the average flow of the river during the years I was here until I went to Medicine Lodge, excluding the months of May, June and July, below the mouth of the Little river, would be three and a half feet.

The average flow above the mouth of the Little river during
620 those years I should estimate at about three feet. I should think the average flow of the Big river above the mouth of the Little river for the last ten or twelve years was not over a foot and a half or two feet deep—not to exceed two feet anyhow. During these later years the Big river has been dry so that it wasn't scarcely running at all.

Q. How much of the year during the last ten or twelve years has it been practically dry above the mouth of the Little river?

A. Oh, I couldn't answer that question. I never examined it.

Q. Well, has it been any considerable portion of the dry season?

A. Yes, it has been dry.

Q. Now, then, state, during the corresponding seasons of those earlier years did it go dry?

A. No, sir, I never saw it dry.

The underflow in this valley is a kind of sub-irrigation,
621 the water that flows beneath the surface, and I think it extends on the east side from Chisholm creek and on the west side about out to the slough. In this vicinity the average width of the valley between the foot-hills is about seven miles. As you go up the river it gets wider. The underflow extends back to the foot-hills on either side. Since the years from 1870 to 1879 I think the underflow has decreased and fallen below the surface in proportion

to the—the same as the decrease in the surface water, the
622 water appearing on the surface. On the west side I dug several wells in the former years; that is, drove these wells, these pumps, and we could reach water from four to six feet. In recent years you would have to go much deeper than that. Now, that is true as far as my observation extends in the valley. In those early years we couldn't dig cellars very deep, and I notice now the average depth of a cellar is much deeper than it possibly could have been at that time, because the water would come into the cellar. You can dig a cellar much deeper here than you could then. There is less water coming into your cellar. If you will examine those old buildings you will find scarcely if any cellars or basements under them. Under the buildings built within the last ten or twelve years they more or less have a basement or cellar.
The residences have cellars now too, but in the early days
623 there were very few of them had cellars. This was because the water was not more than three or four feet from the surface under the valley here. I think that was true on an average. You can dig a cellar most any where now without any danger of water coming into it. During the last ten or twelve years there has been but very little complaint of water getting into the cellars, except in our recent flood of July, 1904. I don't know of any complaint having been made about water being in those cellars dug within the last ten or twelve years until the last flood. During this
last flood I know that water has risen in these cellars that
624 never had any before. This was true generally. This is to a large extent true of those cellars where the water came in from below. The underflow rises and falls with the river.

(Objection.)

I mean that when, to illustrate, there is water in your cellar, as the river recedes that water in your cellar will recede in the same
proportion that the river does, and it will rise in the same
625 proportion, flowing in the same direction—in a southeasterly direction. It is my opinion that throughout the valley here they have to go for water here now four or five feet deeper than they did in the 70's. This would be a mere estimate. I never examined it so as to answer as a witness. While this underflow was full up and the river was full of water of course there was a kind of a subirrigation that the roots of vegetation reached, and corn would reach that, and without any rain you could raise a crop here, that is, with very little rain, in the valley. The corn would grow because the
roots would reach that underflow—would reach that moist-
626 ure. It is not so now. The corn crop in the valley during the first ten years was a pretty sure crop, because of the subirrigation, as I understand it. Corn crops on the uplands during the last ten years are not so certain; they have to depend upon rain.

Examining Exhibit A-1, I would take this picture here to represent the river at a low tide or low water. I think so because those

piles here, this part of the bridge is visible, and when the river was up it was not. It was covered with water when the river was high. Those lower braces that show in the picture you couldn't see when the river was high.

627 Cross-examination.

By Mr. HAYT:

When I stated that during the last flood many cellars in town had water in them I didn't answer from my own personal examination. All I know in reference to that is what I heard others say. This is true except as to my own; I examined my own. It had water in it.

628 I have never talked with any one about this case, but I hav- read articles in the newspapers. Of course I have had general conversations as to this suit, such as lawyers talk when they are together.

When this recent flood was coming down and the water began to appear in front of my residence the idea of that underflow did occur to me pretty strongly. There was not only an overflow but an underflow, and I went to the cellar to see it, and I was just in time to see it come in from the northwest. We have discussed this underflow ever since I came into this country. We called it,

629 not an underflow, but a sub-irrigation. I never heard it called by any other term until this suit came up. The best of my recollection is that we called it sub-irrigation and was pretty proud to call it that—that we had something here that was very valuable—sub-irrigation. We could raise stuff whether it rained or not. We used the term, of course, as an advertising medium. It was one of the good things we had here and we didn't fail to

630 call attention to anything good that we had. The settlement first commenced on the east side here in 1869 and 1870. In

631 1871 and 1872 it was pretty lively. It may be true in part that there were no cellars under those first houses, not because the water came near the surface but because the country was new and they built in a cheaper way; but I think one of the main reasons was because a man didn't care to dig a cellar because it would fill up with water when the river would rise, if it didn't run in while digging it. In June and July when the river was full you couldn't go but a very short distance until you struck water.

In the early days I didn't see any evidence of other channels aside from the channel in which the river now flows; but I think, from what the Indians first told us, that the river used to

632 flow from—this used to be the bed of the river from Chicholm creek to the slough out here about four miles west. I say that at some time the bed of the river extended from Chisholm creek on the east to the old channel on the west in the early days, but never within our days in this town. But the Indians used to tell us from their signs that that was true, that the river once

covered all this country. I thought from the reasons they gave that their claim was well founded. I think myself that it is probably true and the river once flowed somewhere—covered this entire valley. I think this slough is a part of the river, four miles
633 from here,—four miles west of town. Now, I think that at some time in modern times there was a stream that flowed from the Little river right down through the Manhattan hotel in a southeasterly direction, entering the river lower down. I remember when any slight rise in the river occurred it flowed right through the streets, and then it is manifest in this last flood there was quite a current—a tremendous current—
634 there in that same location. I think at one time the river may have run as far east as Chisholm creek; that is about a mile and a half from the Federal building in Wichita; and I think it might have run as far to the west of this place as that old slough; that is about four miles. The old slough rises in the vicinity of Colwich and flows in exactly the same direction with the river itself, and it rises and falls with the river.
635 None of those old channels of the river ran nearer than three blocks of the Federal building.

All I know about the direction of the water is from actual experience in regard to the matter. I dug two cellars and that was the case with both of them. The water came from the northwest to the southeast. I was in the cellar when it commenced to come in at the last flood—as Colonel Murdock would say, percolated through—and it came in that direction, and light objects floated off
636 afterwards to the southeast. I suppose the water came up from the bottom as well and from all sides. I noticed it first coming from the northwest corner. I never heard anybody speak of this but myself. I never spoke to any one about it.

When I first came into this country there were no trees at all except a few isolated trees along the bank of the river, burned on one side. There were no healthy looking trees. The burning indicated to me that there had been a fire. The Indians always burned it off every year, and that prevented the growth of trees, but there was a large growth of grass, of course, in the valley. On the high lands the grass was good, but on the west side of the river it was only in bunches.

This country has been very much improved so far as the
637 growing of trees is concerned, and I think the rainfall has increased. I don't know of this increase from any statistics, but just from common observation. There is a hundred times more timber in this vicinity and up and down the river in this county than when I first came here. Then there was none, absolutely none, except, as I tell you, along the river, or isolated trees here and there. The growing of these trees absorbed some moisture from the ground, but I think they brought good returns from the atmosphere—brought more rain. It never occurred to me that these trees would

gather and hold a great deal of rain and increase the evaporation in that way. I don't think that would be true.

638 My house was four blocks from the river, on the west side. I had to go, there, about four and a half feet to water; and that water has receded four or five feet. I never from actual observation ascertained that the water level was receding in that locality at all; it is only hearsay, as I stated before,—general talk. Well, I know from my own knowledge that it has receded but I can't answer as to the locality where I first built on the west side. I know it has receded on this side of the river.

639 All I know about there being a flow of water underground I have ascertained from looking in these cellars I have described and shallow wells near here.

I used to cross this river perhaps half a dozen times every day, and when the water was up it would come to the top of these braces (indicating on Complainant's Exhibit A-1). The water came above these braces on the piles of the bridge and we used to watch that very carefully for fear that things would lodge there and de-

640 stroy the bridge. When I first came here there was no ferry here; we had to ford the river. We could ford it during a good part of the year. It was dangerous fording almost any time. What made it dangerous was the amount of water and the quicksand. The river must be pretty shallow, owing to the quicksands, in order to be forded without danger, where there is quicksand. I have seen seventeen thousand head of cattle cross this river in one day. They would swim over as we would swim a horse. They could cross here on account that they could swim the cattle and not expose them to going through quicksand. I don't remember seeing any Texas cattle cross this river except those that swam.

641 Chisholm established this trail; it is known as the Chisholm trail. It is true that in driving cattle they usually select narrow places in the river in order that the water may be deeper and that the cattle may be required to swim. It is the safest to swim cattle. They forded here with wagons and teams at the same place and immediately south of that bridge. The wagons would swim. I have seen them swim. In those early days up to 1879 they could cross the river ordinarily by fording with wagons and teams from November until the ice would begin to run

642 pretty bad in the river later on. There were several months you could cross during the fall of the year with comparative safety. You could ford it in October and November, and sometimes March and April the ice would be running so in the river that you could not do it safely, although the men did ford it all the time. The river was forded more or less all the time, or attempted to be. I was away from here from 1879 to 1887, and when I came back in 1887 I noticed a material diminution in the amount of water in the river. I couldn't tell you exactly what was the average flow upon my return in 1887 as compared with the average flow prior to 1879, having never made any measurements or noticed it

with that in view. My opinion is that it would be about one-half. In my judgment, the Big river at this point had receded about one-half from 1879 to 1887. By the "Big river" I mean the Big Arkansas.

643 I don't think I heard this matter discussed until 1890. In 1890 there was considerable complaint from the farmers—from the people living along the Arkansas river. The reason was that the Colorado corporations were taking the water from the river. I don't remember that there was any complaint about the Colorado farmers taking the water from the river in small ditches. I remember that Colorado was taking the water—or corporations in Colorado were diverting the water. The complaint was general that the corporations in particular were diverting the flow of the water from its natural course. That was about the time of the birth of the Populist party. In about 1891 and 1892 the Populist party swept over this country.

644 As I have stated, the underflow was four or five feet below the surface of the ground in the early days on an average. I know that it has since fallen considerably below that. I base my opinion upon the instance of the wells and the cellars I have described. The underflow rose and fell with the water in the river. I base the statement because it has the current; that the river flows right along under; that this part of the river is simply visible, but the river is just simply flowing along under that the same as

645 it is under that channel, and if you dug down low enough you would have another river. I had never run any levels to determine whether or not the water level of the country in the valley outside of the river channel was lower or higher than the river. I don't know what the fact is in reference to the elevation of the underflow or ground water upon high land. I have never been informed that in this vicinity and generally the water table rose somewhat in reference to a rise in the surface of the land. I don't think that has any influence upon

646 it. I have farmed but very little. I have not had any other business or occupation aside from the practice of the law. I had a farm, of course, and farmed to some extent, but not immediately in this valley; in the valley beyond the Ninnescah. For some years I was engaged in the mercantile business here. I have never farmed in this valley myself, and when I said that the crops in this valley had been affected I based that statement upon reports—general complaint. I have not observed the matter closely enough myself to be able to state definitely, only this: I have a brother-in-law that lives just across the river here and owns a farm, and it is plainly to be seen on his farm that he has suffered from that in regard to his corn crop. He had been cultivating corn over there since 1872. He has not had the land in corn all the time,

647 general-y in corn, but it doesn't yield such a certain crop as it used to. During the thirty-two years from 1872 to the present time, I suppose two-thirds of the time he has had the same

land in corn. It would be a mighty good country in which the crop would not decrease if the river had remained as it had been theretofore. On this land he can't raise wheat; he is compelled to raise corn. I know he hasn't fertilized the land during these thirty-two years; it has not needed it. Nature has, I think, been very prodigal.

I have never seen the time when the Big Arkansas river didn't have water in it below the mouth of the Little Arkansas river, but above that I have seen it when it was almost dry. It has
648 usually a pretty good flow in it below, because of the Little river. I never saw the river dry above the Little river, until after the year 1879 that I now remember of. The first time I saw it dry was some time in the eighties.

This last flood here in 1904 was at a time of excessive rainfall here in this vicinity, and during the time the water was up it rained a good deal here, and we don't charge Colorado with that flood.

649 Redirect examination.

By Mr. ASHBAUGH:

We supposed that the sub-irrigation through the first years had a current to it and a flow or movement under the soil. The word "sub-irrigation" is just a word intended to convey the same meaning as you apply to the "underflow."

650 Buffalo grass is a short grass that grows very fertile. It doesn't grow any higher than two or three inches. It grows on all kinds of land. It grows on the high table lands in the State general-y.

651 Recross-examination.

By Mr. HAYT:

The ferry boat that I have spoken of was a large boat that would convey and hold a wagon and team. It is what is known as a flat-boat, and would draw about a foot and a half of water. It was propelled by a pole in the hands of a man who would push it. That was the only boat I ever saw here except little row boats. In the later years this ferry boat was improved by a cable; it was then pulled across.

652 HIRAM W. LEWIS, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Wichita since the 22nd of September, 1876. My business has been principally banking and mortgage loans. I have been in the milling business to some extent for about ten years. I have been pretty well acquainted with the Arkansas river through

this part of the State from observation and constantly living here a quarter of a century or more. I have done a pretty large and satisfactory business most of the time. I have seen the river
653 almost every day, I suppose, or nearly so. From general observation, without making any measurements at any point, I should say that the valley of the river would average eight or twelve miles. Right here at the city of Wichita it would be about six or seven miles. Without having measured it, and simply from observation, I should say that the river at Wichita during the first ten years that I knew it was eleven or twelve hundred feet wide.
655 During the first ten years that I knew the river there was a considerable flow of water in it.

(Objection.)

During the last ten years, above the mouth of the Little river, the flow has been very slight during the dry season. At times there has been no flow at all, when you could walk across it for miles and miles without wetting the sole of your boot. I have done it myself. But as to what the average flow was during those ten years, I couldn't speak of that with any accuracy at all. I never knew that condition to exist up to probably the 90's. I have hunted along the river ever since I came here, off and on, and I don't remember of any time up to the 90's when I could get across without wetting my feet.
656 I don't think that the flow of the Little river has changed to any appreciable extent during the years I have lived here. I think it rises in Rice and McPherson counties. It is a surface stream, supplied by rains and possibly some springs.

The underflow is supposed to be a body of water that percolates through the sand, running parallel with the Big Arkansas river.

657 Cross-examination.

By. Mr. HAYT:

I never saw the river entirely dry across the entire bed until the 90's. I can't give the exact date, but at different times I have been hunting up and down the river along in the 90's, probably 1890, as well as others subsequently, when it was a perfectly dry bed of sand from shore to shore. The year 1874 is said to have been a
658 dry year, but that was two years before my advent into this country. I remember the flood in June, 1877, very distinctly. In the flood of 1904 the volume of water was rather less than the volume of the flood of 1877, I should say. The bridge that was built here at Wichita in 1879 was built after the flood of 1877. I was not one of the county com-
659 missioners and don't know whether they had that flood in mind when they planned the bridge or not. It is a good, common sense rule to build a bridge with reference to floods, but they don't always go in that way. I have never experimented any with reference to the underflow, only pumping it out of my cellars.

I haven't been engaged in farming; I have been engaged in loaning money upon farm lands. There has been a gradual increase in the values of farm lands for the last thirty years from the Government price up as high as one hundred dollars an acre for
660 lands in this vicinity, well improved. By the "Government price" I mean $1.25 per acre. Lands are probably as high here as they have ever been. There has been a great deal of increase right along. The boom in the city of Wichita culminated in March, 1887, but I don't think the land boom ran parallel with the boom in city lots. After the collapse of the real estate values throughout the West in 1887, there was some decline, perhaps, in farm lands in this county, but not nearly so great as in city property. The average value of farm lands from seven or eight miles to twenty miles from town, with good average improvements, is from thirty to fifty dollars an acre. We have all kinds of farmers here—good farmers and poor farmers. I have never heard any complaint in reference to crops from our best class of farmers.

662 A. B. CALDWELL, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Hutchinson, Kansas, and have lived in Reno county about thirty-three years. I am sixty-seven years old. Prior to that time for a short period I was in the State of New York, and then during the war I was in the Army of the Potomac. Previous to that I was on the plains here a good many years. For the three years immediately preceding the war I was a scout for the cavalry on the old trail most of the time. For several years previous to that,
663 beginning in 1850, I was on the trail most of the time. The first time I passed through the Arkansas valley was in the spring of 1850, going through on the old trail as far as Santa Fe, New Mexico. The first that we struck the Arkansas river exactly was near Great Bend, although I struck the Arkansas river near where Hutchinson now is on that trip. On that trip I was part of the time acting as hunter for the trail, and of course went outside of the regular line of march and quite a good ways off from the
664 trail several times. There were two or three trails known as the Santa Fe trail, although they came together and made one general trail. The Santa Fe trail is about twelve miles north of Hutchinson, between McPherson and Hutchinson. It strikes in there. And before that the two lines had come together from the east and it was one trail from there out, running up the river, following pretty nearly the valley, up on the foot-hills near where we knew what was called the stone corral. That is north and west of Hutchinson, and through Rice county, and at Great Bend coming down close, within sight of the river. At Great Bend it crosses the Walnut, within sight of the river. Fort Jerry was established right

at the crossing in 1861. The trail runs west near Pawnee rock. On that Pawnee rock there was a crossing that was sometimes used by fur traders and trappers. It went on up west where Lamar
665 now is, in Colorado, passing Garden City and Dodge City and Fort Dodge. Fort Dodge was a military post in 1861, and pretty near the river. If I am right, Bent's fort was about forty miles west of the Colorado line. The trail followed the river fifty miles or more above there. The site of Bent's fort was changed. Old Bent's fort was a little farther east than the later Bent's fort. The Santa Fe railroad follows the old Santa Fe trail very closely from Hutchinson to Las Animas, and is directly on it a good
666 deal of the way, and very close all of the way. When I first went on the trail I was simply a driver and all-round boy for the train, and the next time I went through I had acquired a little proficiency, perhaps, and I acted as hunter for the train, whose business it was to have game in the camp grounds as early as pos-
667 sible after they came. I was hunter for two or three trains, and in some respects in one or two of the trains I was confident of the overseer of the train. Where a man was put in charge who didn't know the country thoroughly, I was adviser simply to advise him where he could find good feed and good water and good camping places.

In 1859 I went into the employ of the Government as scout and guide. I was with the cavalry on the line of the trail for
668 three years, on the Santa Fe trail. At that time we were having considerable trouble with the Indians and the overland stages on those stage routes through there. The Overland Stage Company was not established then, but Holliday was running an independent line. The intention of the cavalry was to protect the cattle of the trains that went over the trails from the Indians, which we were having trouble with all the while, and I was pretty well conversant with the country and being a pretty fair trailer, was selected as scout and guide. This employment continued until 1861.

I went into the Army of the Potomac and served until Gettysburg, where I was shot through the body twice and through
669 the right arm. I belonged to a band of sharp-shooters.

I came back to Reno county in about the year 1870, and have lived there ever since. For a number of years I was a farmer, raising some stock, and then I have been for a little over
670 twenty years a real estate agent, handling for a number of years the lands belonging to the Kansas Loan and Trust Company, and some belonging to eastern parties. In my operations I travelled over Reno, Rice, McPherson, Stafford, somewhat farther west than Garden City, and north as far as Scott City and back again. This distance I travelled over several times a year, and some parts of it oftener than that. I am fairly well acquainted with the valley to the Colorado State line. West of Wichita there are places where the valley would be forty miles wide, until you get up near the

Colorado line where it will be five or six. It varies. Through
671 Reno county, on an average back to the foot-hills it would be twenty to twenty-five miles. Through Barton county, fifteen miles; through Pawnee county ten miles; through Edwards county ten miles; through Ford county six miles; through
672 Gray county four or five miles; through Finney county four or five miles; through Kearney county four or five miles;
673 in Hamilton county it is quite narrow at the State line. In the first county in Colorado the foot-hills come down almost to the river, and naturally there is no vegetation to amount to anything. There is no original vegetation of
674 any value there. Naturally and originally, in 1850 and 1851 there was but very little vegetation except buffalo grass in the valley, even down on the bottoms. Buffalo grass is a fine grass that grows close to the ground, matures thoroughly in August, is ripens on the ground and is equally beneficial winter and summer for feed, although it is not green in the winter. There was some of the bottoms that had some tall grass, but it was not common.

As to changes I have noticed in the natural vegetation in the valley between Wichita and the State line, first came in a bunch grass that grows in a thick bunch; then came a great deal of blue-stem; that grew eight or ten feet tall sometimes; then a thicker and heavier grass in the bottoms came in. Those have been the growth of the later years, and they seem to follow the first
675 blue-stem that would follow the breaking.

During the eleven years from 1830 to 1861 I saw the valley between Wichita and the State line every year, and sometimes three or four or five or six or fifty times a year, as the case might be. During those years I was on the Arkansas river I knew the valley practically two-thirds of the time. I saw the river, because I was fording it often. In my employment as hunter for the trains I generally kept pretty close to the valley. There were plenty of Indians at that time, and they were hostile, and it was dangerous to get back from the train. During those eleven years I crossed the river very often. I probably crossed it in those eleven years twenty
676 times a year or more from Hutchinson west, especially west of Dodge and Garden City. It was mostly in there where the trail was close to the river and where, when I was a scout for the cavalry, most of our crossing came in.

677 The bridge at Hutchinson was a very long bridge, one of the longest in the country.

Since 1860 the river does not spread out over the surface so much now as it did then, by one-third. My judgment is that up to the State line it has been a good deal in the same proportion, although not so much farther up. The banks have filled in and narrowed. During those eleven years from 1850 to 1861 when we were crossing the river it would generally be in places up to the axle of the wagon in crossing with a train; but I mean not during any flood, but dur-

ing reasonable weather when we felt safe to ford it, as we did
678 a good share of the time. It would be something like coming up the axle of the wagon. To-day at Hutchinson there is a large part of the summer that every bit of the water would run through a six inch tile. There are times that you can cross there without stepping in the water; that is at low water. During those first eleven years there were times when you couldn't ford the river. There were times we had to lay by; we couldn't get across. During the last few years there isn't near the same volume of water during the season as there was during those earlier years. This diminution, I should say, was noticed first since 1885. It was noticed in
1886, 1887, 1888, 1889 and in there. It has been nearly sta-
679 tionary for the last few years. For the last seven or eight years there hasn't been much change.

I mean by the "underflow" the percolating water from the river out through the soil at either side. There is unquestionably such a flow as that known to this valley. If a man will dig a hole four feet square, as I have done, away from the river, he can see it. He can dig it a mile or two miles away. I have seen the fact of this underflow tested in this way: A few years ago there was a great hullabaloo about the underflow, and we were trying to prove this was the best country on earth, because God didn't send the water down from above but sent it up from below, and as a real estate man I was interested
in that, and I was proving my proposition. I have observed
680 that at various points some distance from the river there was a flow that came towards the river after you strike the water. You would dig down from four to six or eight feet and you would strike water flowing in, and if you dropped some light material in it would seem to float across to the opposite side of the hole. The current of the underflow from the river was away from the river; it would continue until it struck some obstruction—hard land or something—that threw it back.

The North Ninnescah valley is thirty-five miles from the
681 Arkansas river. Between that and the Arkansas river there is a heavy line of hills. From 1887 or later springs began to fail—later than that, rather. Wells began to fail in that valley; they began to have to dig them deeper. Places where men had fished from year to year had dried up and knew the fish no more. Many pastures of which I had charge that had springs in them dried up and failed entirely in water. It has been a little better for the last two or three years, but I laid it to the fact that the underflow left the Arkansas river up by Dodge City, and, percolating through those sand hills, came in back through the Ninnescah valley, which it could do without striking any high or hard land, but if it got below Dodge City it couldn't have gotten over there. The river bends near Dodge City and flows to the northwest for some distance until it reaches Great Bend. The high land south of the river at Dodge City is made up of sand hills, which I can remember when they were bare, white sand, and my idea is that those sand

hills didn't hinder the flow, and that it got in below there and
682 came down in this valley. The current of the underflow is not exactly parallel to the flow of the river.

(Objection.)

It flows the general direction of the river, but of course obstructions or anything throws it one way or the other to a certain
683 extent. As a general rule it follows the general direction the river may be flowing.

(Objection.)

I have observed changes in the height of that underflow during the last few years. We have had some drive wells and we found in the wells a change in the height of the water from two to four and in some cases as much as six feet. In driving wells in the valley we have found that we have had to drive deeper than we formerly did, to the extent, on an average, of three feet. This condition goes pretty nearly across the valley, as far as my experience goes. Up and down the valley I couldn't speak further than from
684 Hutchinson a dozen miles west, and north and south thirty miles. The general belief has been, and it is my belief, that the lowering of the underflow, has affected the production of corn lands particularly.

(Objection.)

This belief is founded on the experience of several years, and the cause is the dropping of the underflow. The advantage of the underflow as it was during the first years to the growing crops was that in those years we had no general "firing" of fields.

(Objection.)

685 During the first years I was here the corn got its moisture in this valley from below, mostly. We didn't have our rains as we have them now. We had one or two heavy rains during the season and then we had no more rains for a year. The corn mostly had to get its moisture from below. Now our rains come gradually and slow and sometimes more than we want. I consider that the falling of the underflow has affected the certainty or sureness of a corn crop in this valley.

Cross-examination.

By Mr. DAWSON:

I don't think the rains in the valley of late years have been
686 more in volume, but better distributed. If better distributed, that is an advantage to the country. I don't think that the corn crop has fallen off in its productiveness per acre more than other crops. In the valley lands the wheat has fallen off more than corn. Undoubtedly there are places where the valley lands are im-

proved by having the water removed a little further from the surface. A number of years ago I was interested in taking affidavits for the Santa Fe railroad of corn and wheat crops. We got a good many wheat crops that went as high as sixty bushels to the
687 acre, a thing we couldn't do now. We got those affidavits for advertising purposes for the Santa Fe. We were careful to get the facts. Those affidavits were to be used by the Santa Fe in advertising the advantages of the lands in Kansas along
689 the line of the Santa Fe road. We took them I think nearly fifteen years ago. I have seen statements of crops in papers of late years showing that the crops were not so good, but as to what information the statements were based upon I have no knowledge.

I have been in the real estate business for a number of years and have been a little addicted to getting out booklets advertising
690 the advantages of my locality. In these booklets I have not called attention to the falling off in the productiveness of Kansas land. That is not what the booklet was gotten out for. The crops throughout the part of the Arkansas valley with which I am acquainted are very much more diversified now than they were twenty-five years ago. There are many crops raised here that
691 could not be raised twenty-five years ago. Considering the value of the crops, the lands in the Arkansas valley with which I am familiar are much more productive in dollars
693 and cents than they were 25 years ago.

Twenty years ago there was practically no alfalfa grown in Sedgwick or Reno counties. They raise a large amount of alfalfa now in those two counties. It is a productive and profitable crop. They ordinarily make about three cuttings a year, aggregating from five to ten tons per acre. The alfalfa crop has not been tested to see whether it has been hurt by the subsidence of this underground water. I know something of the growing of alfalfa but not a great deal. I believe it is true that the crop is better if the water
694 don't come too close to it. Where we have a good stand of alfalfa it is as remunerative as a good crop of corn on the same acreage. Quite a quantity of land which was formerly in corn has been converted into alfalfa land. I have noticed on lands where the corn crop had grown less in later years good alfalfa had been produced afterwards. We have reached some different markets since fifteen years ago. The prices brought by farm products are not as great as they were fifteen years ago; that was a period of depression, as you are aware. If prices were at the same level
695 fifteen years ago as now, the acreage in cultivation in Sedgwick and Reno counties would produce as much in dollars and cents as it would then, taking into consideration the diversified crops, because there is double the amount in cultivation. There is nearly or double the amount in cultivation in Reno county that there was fifteen years ago. The idea is this, as I understand your question: You asked me if the crops fifteen years ago would—if the crops now would not bring as much as they would fifteen years

ago. Well, there is double the area now that there was fifteen years ago.

Q. I mean acre for acre, considering the diversified crops.

A. Yes, considering the different vari-ties of crops.

Q. Then with the diversification of crops that you now have the putting in this piece of ground the sort of crop that suits it, and in another piece of ground the sort of crop that suits it, the land
696 in these last two named counties is just as valuable from a productive standpoint as it was fifteen years ago, is it not?

(Objection.)

A. Yes, sir.

The hot winds in this part of the State are not so prevalent now as they were in the early times. I can't say what has caused the change. The hot winds used to endanger the crops quite materially. We don't have nearly so much trouble from that cause of late years.

The rainfall is better distributed throughout the season for the growing of crops than formerly.

697 Q. You have more dews now and fogs than you had in the early days, do you not?

A. Somewhat. I don't know as we have more dews, but more fogs, and that in itself is an advantage to the crops in this part of the State. Any fog is an advantage to the crops. In the western part of the State the change has not been to the same extent as here. For instance, last year, you go as far west as Larned and Great Bend, for seven consecutive months it didn't get a drop of rain.

I don't know as I can give the width of the valley in some of its narrowest places. There are places where the valley comes down to a width of two miles or even less than that, but we are pretty well west in the State when we come to those extremely narrow places.

698 I have a notion that there is underflow under this second bottom in places, about the same level as the water on the first bottom. I never ran any levels to ascertain the level of the water; it is merely a matter of the eye and general reputa-
699 tion. I dug holes at different times, some considerable distance from the river bank, and found that the water came in from the river. The water came in nearly parallel with the river, but not entirely. I didn't intend to say in my examination in chief that it came directly across. I wish to say this, that where there is a bend in the river below or above it comes down parallel with it, and generally where it comes directly from the river it may come down diagonally. For instance, if the river is running east and west the flow is not north and south directly; the flow would be nearly east and west, but possibly not directly east and west.

700 It varies somewhat by the hardness of the land or anything that may lie between. The only experiments I have made have been by simply dropping in a little piece of wood or something

to see where the flow was going. The reason I wanted to know was because we were proving we had an underflow in the Arkansas valley. I am not busy doing the same thing now; I haven't done it for some years. We were advertising the underflow then very
701 much; we haven't done it very much lately. It is generally accepted now. Generally, these holes were below the wind or below the effect of the wind; they were supposed to be.
702 There was one very dry year between Wichita and the Colorado State line between 1850 and 1860 or 1861. I don't know where or when, and I can't place it. My memory is that there was one year that was extremely dry and the water was extremely low, but I would not wish to place it exactly. During that year there were miles along the river at different places where there was practically no flowing water in the river—very little at least. I wouldn't say that in the year 1860, the year before I went into the Army, the Arkansas river was practically dry from Witchita to the Colorado State line, and yet I wouldn't say that it was not.
703 There was one year that there was practically very little water in the river. That year people travelling up and down the river sank holes in the sand of the river to get water at different places.

(Objection.)

It was not uncommon, however, to sink holes in the edge
704 of the river to get clear water. In 1874 I think there was no time but what water would come up to the hubs in crossing at Hutchinson. I lived south of the river there and we used to ford it. We had one or two very dry years in the 70's, but not entirely dry. I don't recollect that the river was dry in places between Wichita and the Colorado State line. We didn't have years in which the water was practically as low as it has been during the last five or six years.

The sand hills that I have spoken of are quite common along the river in Kansas. Sometimes they are adjacent to the river, not generally, but farther back. On the north side they are farther back than on the south side. On the south they come up pretty close in places. On the south side they would be within a mile of the river in places, and on the north generally two or
705 three or four miles. They were evidently made by the blowing sand, but I couldn't say where the sand came from. It is very nearly the same kind of sand you find in the river bed, In places these sand hills are a long distance from the river.
706 as much as forty miles away. These sand hills were constantly changing up to a few years ago until they got covered with vegetation. Next year there would be a sand hill a mile from where it was last. We have several of those rows of sand hills diagonally across the river. They don't follow the trend of the river. The sand hills along the Arkansas river don't always
707 follow the trend of the river. They don't always keep approximately near to it. In my opinion the sand hills

through Hamilton and Kearney counties uniformly follow the course of the river along on the south, although I am not exactly conversant enough with that at the present time to be positive.

708 If I said that we found the underflow was away from the river, I meant it was away from the river that we found the underflow, and not flowing away from the river. I didn't

709 conduct any of these tests as to wells myself; it is mere hearsay. I have knowledge from my own personal examination that the water level has fallen, because I have put wells deeper on land. We have to put down our drive wells lower than we

710 did twelve years ago, in the same place. It is my understanding that this underground water is supplied by the

711 river. I don't think that it is true that the level of the water in wells on the uplands and second bottom lands shows higher the last few years than it did fifteen or twenty years ago. I don't think they strike water at the same depth in the same locality on the uplands to-day, because we find on the uplands our land pastures have gone dry. Fifteen years ago we had water in them. I don't know as the river has any influence on the underground waters which lie under the surface of the upland. I have not noticed in going up and down any correspondence with the river on the uplands, but I think there is less water under the ground on the uplands to-day than formerly. I have explained in my direct examination my reason for thinking that those lands south of the river, those uplands twenty miles away, had given out,—that possibly the flow at Dodge City might have went back of the sand hills and went down about there and that the water might

712 have come from there. I may be wrong. It is my idea from my observation of the country there at Dodge City, where these sand hills are south of the river through Hamilton and Kearney counties, that there is a great loss of the river out to the south through the sand hills. I have always accepted the gospel that this underground water in the valley lands in this and Reno counties comes from the river. Every man has shouted this gospel for a good many years. It was a belief of the real estate men and

713 newspapers. Your theory is, if it comes out from the river when the river is high, it moves back toward the river when it is low, and that probably may be correct. It will drain to the lowest point, naturally.

I should say that those lands have been as high in value for the last five years as they ever were for any five-year period since

714 I have known the country. They got the lands in Sedgwick county all under occupancy and use within the last three or four or five years. There was much less land in ploughed crops prior to 1885 than during the last five years, and there is some more timber. It is a generally accepted theory that the run-off of water into the river would be much less with a large area in ploughed crops than it would be when it was in grass lands. Until the ploughed ground is saturated it takes up more water than grass

land. For an ordinary rain or reasonable flood the ploughed land would be a benefit in taking up and holding back the water. We have been wading around in our parlors raising our furniture for the last three springs in Hutchinson, a thing we never did before. The water didn't come from the river; it just simply fell on the ground and flooded us out. The rains were local.

715 The first bridge was built at Hutchinson back in the 70's. Prior to that time we forded the river. We could ford it on
716 a horse or with a wagon the greatest part of the year—oh, any time. The bridge we now have over the river at Hutchinson is one-third shorter than the first bridge that was built there.
718 The bridge we have now was built fifteen years ago. I should think that from fifteen to seventeen years ago the river was just as large and had as much water in it on an average as it had in former years. I think when they put in the big bridge, if you want to get the facts of it, I think there was a little real estate advertisement that did it, that being the longest bridge in the State, and also they reached out beyond where they thought there was any possibility of the flood going around it. I was in the legislature when the second bridge was put in, and we didn't give them money enough to build it as long as they wanted to. I cut the appropriation down from fifty thousand dollars to twenty-two thousand dollars.

719 The bottom lands are very much more valuable than the uplands. The bottom lands are fruit lands. We have some of the largest orchards in the world down near Hutchinson. There is one orchard of over a thousand acres. They generally plant the orchards within four or five miles of the river, and only one
720 side of the river seems to do well; that is the north side. The general idea is that the water comes nearer the surface on the north side. The river there has a slightly south trend and it is general-y believed that it catches more water on the north side.

721 Redirect examination.

By Mr. ASHBAUGH:

There are no marshy lands as we know "marshy," or as it is understood, that I know of, in the Arkansas valley. I cannot understand how for general purposes any land would be benefitted by lowering the underflow. I think there are some pieces with the original underflow as it was known that are better now for alfalfa simply because the underflow was too close to the surface for
722 alfalfa. Alfalfa takes a deeper root and does better when it goes a little further for water. There is not probably a great amount of that character of land in the whole valley. Alfalfa is not yet a large crop in the valley; it is a good deal grown, but it is not by any means a leading crop. The productiveness of the land in the valley has been affected concerning corn crops. The

change has been detrimental. It has been detrimental to vegetables raised in the valley.

Q. Now, you speak about the price of land being higher. State why it is higher in this valley now than it was thirty years ago.

A. The price of land in the valley is no higher in propor-
723 tion on the upland than it was thirty years ago. It is simply the increase of population and the increased demand for farm lands and the increased knowledge they have got for profitable farming for this part of the country.

Markets have had a good deal to do with it. For instance, on our apple crop, we have cold storage in our local markets now that make it very valuable. The land might be more profitable to farm and yet not as productive for certain lines of crops.

The purpose we had in sinking holes in the edge of the
724 river was to get clear drinking water. It would become clear in the hole while the river would be surging and very muddy. I don't mean to say nor to have the conclusion drawn from it that at the time these holes were dug there was not any water in the river.

(Objection).

In the western part of Reno county there is one of the longest ranges of sand hills. They start in Stafford county and run into Reno and run nearly due south away from the river for twenty miles. Their whole trend is away from the river. There is another range of sand hills that takes in across the south side of Reno that follows near the line of the Rock Island railroad and goes nearly to Dodge. In some places they are quite a distance from the
725 river. I never had any idea that these sand hills were formed from the sands blowing out of the river bed.

Q. From the location and construction of them would you say that that was a possibility?

A. No, I would not. There is another range of sand hills beginning south of McPherson and running west until you get past Great Bend. They gradually draw nearer the river all that way. Starting in some twelve or fourteen miles from the river, at Great Bend they are not over a mile, I think, from the river, or something like that.

The connection between the underflow and the flow of the river is shown, I think, because in high water or in the high season the underflow is higher.

(Objection.)

726 The underflow regularly follows the rise and fall of the river.

The fill along the river at Hutchinson was made by grading up to the bridge. The present bridge is much higher than the old one. It was graded up and filled in to get off and on the bridge. This fill is an approach to the bridge. That is all the fill there is

there. This fill was not for the purpose of narrowing the banks of the river.

727 The storm that caused the flood of 1904 was a rain storm that started in near Lyons, northwest of Sterling, and Cow creek there was six or eight feet out of its banks. The Ar-
728 kansas river didn't get out of its banks at Hutchinson.

728 G. N. DICKSON, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Wichita since 1885. I am in the real estate business now. In 1887, 1888 and a part of 1889 I was secretary and manager of the street car company. My connection with the street car company ceased about the first of June, 1889.

The first span of the Douglas Avenue bridge was taken out after I quit the road in June, 1889.

729 A. B. CALDWELL (recalled), Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I am acquainted with the reformatory located at Hutchinson. The reformatory is located upon the northwest quarter and the east half of the northwest quarter, the southwest quarter and the southeast quarter of section 19, and the south half of the southeast quarter of section 18; all in township 23 south, of range 5, west of the sixth principal meridian, in Reno county, Kansas. The bill locating the reformatory was passed fifteen years ago, and work began upon it immediately. The State of Kansas has been in possession of these premises for fifteen years.

ARKANSAS CITY, KANSAS, August 22–23, 1904.

731 R. A. PATTON, Arkansas City, Kansas.

Direct examination.

By Mr. SMITH:

For the last three years I have lived at Arkansas City, Kansas, and before that time and since 1882 I lived on a farm four
732 miles north and four miles west of Arkansas City. I was farming there, and my land was second bottom. It was about a mile and a half from the river. During the years I lived on this farm I crossed the river quite frequently. In the early years we crossed by ferry. The ferry was established when I went there,

and ran, I think, eight or ten years afterwards. After I got
733 there they built a bridge and the ferry was discontinued.
During the 80's you couldn't ford the river at that point at all. I never did. I never forded it at all at any time. The river was not nearly so wide in 1890 as it was when I first went there. It got smaller. When that ferry ran there it ran from one bank to the other; that is, the banks would not be full, but the ferry boat ran from one bank to the other. As to the width of the river, I
never measured it. I should think it was between two and
734 three hundred feet. Oh, more than that; that many yards.
I don't know. It was a wide river—that many yards, maybe. Since 1891 or 1892 it is not so wide as when I first went there; that is, in low water. When the river is up there is just as much water as there ever was, but when the river is lower it goes down a good deal lower than it used to. At any season of the year now when the water is low it gets very much lower than it did in the early days. I don't think the river is much over one-third as wide now as it was in the early days—not much over. I can't state when I noticed that the flow of the river was diminishing; I noticed in the
pastures when the water got away from me; but I should
735 think it was along about 1890 or thereabouts. I couldn't
tell exactly. My farm is at a big bend of the river. The river is north of me and west of me and south of me, and then there is a creek runs right across here called Spring creek. In high water when the water was high there would be an island in there practically, but when the water goes down this Spring creek would turn the water out there until I think Spring creek was pretty nearly on a level with the water in the Arkansas river at that time, so that this creek came in under the farm and damaged it some, and I made a pasture across that end of it and run my stock down
there. It was half a mile from my house. My cows or colts
736 or anything I was not using I put down there. There was
plenty of water in there, and there was fish in that little creek when I first went there, and it got weaker and weaker until finally there was no water except in two or three holes on farm. And later on the water disappeared in those holes entirely. Then I took a spade and I think I dug down eighteen inches and the water came in there six or eight inches deep in that hole, and the stock would kneel down and drink out of that hole. Later on the water disappeared there. Then I went and dug deeper down, I should think possibly two and a half or three feet, and I didn't come to any water. You couldn't get to it any way, and I had to abandon the pasture. There was no water at all. I think the disappearance of the water in these holes was about the same time when the flow of the river was diminishing. As the water in the river went down the water in these holes went down, and I think the water
in these holes stayed on a level with the water in the river.
737 When the river went down the pastures dried up.

Cross-examination.

By Mr. HAYT:

I came here from Michigan. I lived in that State prior to
738 coming to Kansas about seventeen or eighteen years. I practiced dentistry and medicine there. While I lived there I noticed a large growth of population in the immediate vicinity of where I lived. I lived in the city and didn't notice any diminution in the water in the streams as population increased. When I first came to Kansas I located on this farm that I have spoken about. I farmed a place above here—raised wheat principally, and
739 very little corn—five or six acres, probably. I said that when I first went there the river was two or three hundred yards wide, as near as I could designate it. I never measured it nor figured on it at all. During high water this spring there was more water than ever before. It is only in times of high water that I notice a diminution. The dry season here has changed. When I first came to this country we used to have a June rise here. We thought it was from the snow in Colorado. But in the last few years we didn't have those rises like we used to have them, and the dry season usually in the river now is about July, August and September. This season especially it has been raining all the time, but from usually the first of June until September we had a big river here. From some cause or other that has disappeared, and we do
740 not have those big rivers like we used to unless we have rains as we have been having. I never forded the river in those days, but I have seen others try it and have seen them get a wagon box washed off the wagon and get in trouble. I have seen them ford the river when they didn't get in trouble. I rode across with a man once when they didn't have much trouble. I rode across it once myself on horseback, and coming back I didn't go exactly in the right place and got off the track, and swam my horse. I lived a mile and a half from the river, where I could see it. I never saw but two wagons cross, and one got across all right and the other didn't.

741 I think we have more rainfall now than we used to have during May and June, and it is more equally distributed throughout the season.

This ferry I spoke of was a flat bottom boat. They had a large rope stretched from one side of the river to the other, tied to big trees, and the boat ran on a pulley on this rope. I should think the boat drew about five or six inches of water and would carry four horses and a large wagon, loaded. The landings were not built out. There was a bluff on the west side of the river and they dug a place down for the wagons to go up. On the east side they built out a sort of pier in very low water, only a little ways out. At that ferry when we built our bridge there one side of the river bed was rocky and
742 the rest was sand. I should think this bridge bottom was ten or twelve feet above the bottom at the ordinary level.

Spring creek was northeast of where I lived, seven or eight miles, off in the Tannehill district. It is eight or nine miles long there, that I know of, and maybe longer. The creek comes in from the east and it runs I should say within twenty-five or thirty rods of the river; then it turns and runs due south and empties into the river, and that leaves a bottom here about four miles long
743 and three miles wide, and that, during high water, will be practically an island. This creek has three or four bridges on it, and the water got so high that it ran over the bridge this spring. That creek gets high when it drains off up there, whether the river is high or not. I don't believe that the creek bottom has filled in. I believe it is just as deep on my place as it ever was. It is all farming land up above me.

In growing wheat I always rely exclusively on the rainfall
744 for the raising of crops. As to the other farmers in this vicinity, we differ. Some of them claim that corn roots go ten or fifteen feet into the ground, but I never found them down there. I call it a crop with a shallow root, but we don't agree on that.

This bridge is approximately two or three hundred yards in length. The approach on one side was built in about a hundred feet, but on the west side it ran right against a bluff or rock bottom.

745 I couldn't tell whether the water during the winter months is less or more now than formerly. My land is on the east side of the river. There is a bank or a high place on the west side of me, between my farm and my neighbors. My neighbors have some of what we call second bottom; then it drops down possibly eight or nine feet to what we call first bottom. Mine falls back towards this creek, which is the second bottom—falls east. Theirs slopes west. There is a kind of ridge down through there about the center. This second bottom land of mine is about eight or ten feet above the first.

746 Redirect examination.

By Mr. SMITH:

The approach to the bridge was not made in the channel of the river itself; it was out on the bank. This bridge was built about 1890.

747 P. H. FRANEY, Arkansas City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in this city since 1880, mostly in the city, and on the east side of the river. The river makes a bend right near this City,

and after flowing past the city south it bends east and then
748 goes a little north, and then it winds and goes south again. It flows east from the city about eight miles. Arkansas city is located in this bend of the river.

I came here in 1880 and began to construct the canal in 1881. It begins above the city about two and a half miles and runs through Arkansas City and empties into the Walnut. The Walnut
749 is a stream east of the city; it flows south and empties into the Arkansas river about two and a half miles southeast of the city. This canal is about four and a half or five miles long, flowing through the west part of the city and to the south
750 and east and empties into the Walnut about two and a half miles above its mouth. The original canal was dug in 1881, and was extended, I think, in 1886 or 1887, by digging a canal up from the old head-gate through the bottom. It was fifteen feet wide in the bottom, with a one and a half foot slope. In some places we had to cut eight or nine feet deep. It was dug, I suppose, for water power, to run the mills that were constructed after the canal
751 was built. The Arkansas Milling Company and some planing mills are there now. There was a wind mill factory, a chair factory and a corn mill run by this water power. These are all I think of now. (Objection.) The electric light plant is located at the foot of the canal, and there is a foundry down there
752 which gets its power from the canal. (Objection.) I think the first one of these mills or manufacturing establishments was completed in 1882 and got its power from the canal. All of these establishments that I have referred to were supplied with water power from the canal. The pump mill was put there in 1882, I believe. Then the next one was put there afterwards by Mr. Hill, and this was added to by the Arkansas Milling Company. Later, Mr. Speers built a mill there. Then came the planing mill.
753 Next, I believe, was the chair factory, a mattress factory, a wind mill factory, and the electric light plant. I would say that the electric light plant was built about 1888. The canal is about a mile from the Arkansas river at its farthest point and runs somewhat across this bend to the southeast. It empties into the Walnut rather than the Arkansas in order to get the greatest fall.
754 The water from the canal empties into the Walnut first and then into the Arkansas river below the mouth of the Walnut.

I remember the ferry across the Arkansas river, and crossed it in 1880. I think I saw it first in November, and the river was about six hundred feet from bank to bank and the stream that I crossed on the ferry was about two or three hundred feet. The average flow of the river during the last five or ten years prior to 1904, excluding the months of May, June and July, as compared with the flow of the river during the first ten years that I knew it, has been diminishing. Last year we had plenty of water; it was an
755 excessively wet year, the wettest known to me. We were seriously affected by floods here in the first of July, 1904.

(Objection.) The water in the canal has diminished as compared with the amount of water in the canal during the first ten
756 years. (Objection.) This diminishing of water in the canal was noticed about 1887, and we had to dig new channels to let the water come into the mouth of the canal from the river; that is, the water had subsided in the river so that we had to go out and dig a new channel to let it into the mouth. This has been repeated at two different times. I dug it twice myself; the first was about 1886 and the other was a year or two later. The last one, I think, was along in December. The result of our digging was that we got more water, in fact the water had failed to come into the mouth of the canal as it originally did.

When I first graded that canal I could sink a barrel in the bottom of the grade anywhere in the lower parts of the city and get drinking water. I could sink a barrel down right here west of us and it would come up about two-thirds on the barrel. Last fall I had occasion to dig down on the line of the canal and found no
757 water on top of the rock at all; before that I could find water there. The lower part of the city near the river was underlaid with water from the river.

I have been street commissioner of Arkansas City for about ten years; I was appointed in 1886 or 1887. I have had occasion to notice in digging ditches or sewers or wells or cellars whether the water level has changed since those early days. In about 1887 or 1888 I dug a ditch to drain the slough in the west part of the town here, and for my level I generally took the top of the water by digging down so far and I would keep my grade close to the
758 top of the water. I would dig down to the wet sand and would follow that for my level. In 1904, before the high water I went over the same ditch and didn't find the flow of water that I did then. The water level has lowered. (Objection.) I should think it had gone down three feet anyway.

I think it was in 1880 that I saw a boat coming down the
759 river at Gueda Springs, which is about seven miles up the river from here. I don't know where the boat started from; it didn't land at Gueda Springs, but continued on down the river. It seemed to be loaded with something, but I don't know what. There was another boat here, but I never went down to look at it.
760 (Objection.) I was busy at the time. It was generally talked that there was a steamboat here at the mills, but I didn't see it. (Objection.) The name of that boat, as I understood it, was the "Aunt Sally." I think it was in 1886 or 1887. I
761 knew about a man by the name of James Hill; I think he was a stock owner in that boat, and he was the projector of this canal. I built this canal under his supervision; and I think he erected the first flouring mill here. This is the Arkansas City Milling Company now. (Objection.) I believe he was the
762 president or superintendent of the canal and of this first mill. They used a steam boat at that time to ship the

products of their mill, and I suppose they had railroad transportation.

During the last years, excluding 1904, I don't think the flow of the Arkansas river has been near as much as it had been for the first five or six years that I knew it.

I don't know of any other boats being here.

Cross-examination.

By Mr. DAWSON:

I never saw but one steamboat, that which I saw up there by Gueda, coming down the river, around here. I never saw
763 that boat come back. It was a small boat, I think, about forty feet long. She is not the same boat as the "Aunt Sally." I never saw the "Aunt Sally," and all I know about the boat being here is the statements of others. The "Aunt
764 Sally" never came back here, so far as I heard or saw. I have never seen any more produce being shipped from these mills by boat, but I have heard of some barges—flatboats. It was along in May, I think, that I saw this boat passing at Gueda. In the early '80s, we had what we call the spring rise, along in June, as a general thing. We had more water at that time that I
765 speak of than there is to-day anywhere. We can find times now when boats could go down the river, but there would be trouble in sending such a boat down this year sometimes during the summer.

The slough I spoke about is on the west side of the town, on the same side on which the Arkansas river is located. The town lies, really, between the Arkansas and the Walnut rivers. Draw a line across on Chestnut avenue from one river to the other, and they are very nearly two miles apart. Except for the rise than the town is built on, the ground between the town and the Arkansas
766 river is lower than it is on this street (Fifth avenue). It also falls off toward the Walnut river. This slough is about a mile and a half long and runs parallel with the river and between the town and the river. It was about the lowest ground you would find between the town and the river.

The water level has fallen, according to my investigations, on the low part of the town, on the west side, toward the Arkansas river. I drained this slough in 1887, I think, and I think that the water level of the bottom lands between the town and the
767 river is lower than it was then, except this year. We drained this slough into a sand bank down at the river, which let it gradually go into the river, for the purpose of getting away some water which was standing down there. This draining work dried up a good deal of ground. Down along the bank of this canal and within two or three hundred feet of where I used to use the barrel to get water to drink, when we were digging the canal, there was a cellar or basement dug for a mill right on the bank of the canal a

few years ago, and they went down to bed rock there and
768 found no water. I expect our drain has worked pretty well.
When I sank this barrel out of which I got the water in the immediate vicinity of this slough the slough hadn't been drained. My experience in late years after I had drained the slough and they went down in the vicinity of the barrel to get to the bed rock was that they found no water. I didn't sink any holes or make any investigations which threw any light upon the water level in this vicinity at any other place than west of the town and between the town and the river, and I didn't drain any other sloughs or natural depressions in the land except this one I spoke about. That slough was the natural drainage for the surface water that ran off this ridge on which the town is situated and the country lying between the slough and the river. When it would rain the waters on the ground on each side of the slough would run into the slough, and if
it were a hard rain they would sometimes get high enough
769 to run out at the lower end before we drained them. The
lower end of the slough was not low enough to drain all the water out and it would leave standing pools, and we corrected that by putting in a drain or lowering the slough at the lower end so that when it rained it would carry all the surface water out and didn't leave any in the ground—didn't leave any pools. After we had done all this and then sunk holes in the ground we found that the water didn't come as near the surface as it used to.

This canal that I speak of was built about 1881 to 1887, and I was
foreman on it. Its head was in the east bank of the Arkansas
770 river, and the first head-gate was right close to that. We had
to cut quite an opening on the bank of the river where the water was taken from the river. This was cut through sand on the bank and some surface sediment. We put in a dam to turn the water into the head of the ditch, made of brush, rock, mattresses, etc. We had lots of trouble with it; it washed out, and when it would wash out we had trouble in getting water in the canal and would have to put in another dam. We continued to do that until we changed the point of the head-gate. They put in a crib dam at that place, filled with rock, which is there yet. After they put in
this crib dam for a while we could get water in our head-gate.
771 I think the Arkansas river at that point during almost all
the periods of the year carries a great deal, of sand and earthy material in it, and I expect that this sand has filled up back of the crib dam considerably. I suppose as it filled up that must have raised the bed or bottom of the river on which the water flowed, and it also throws in sand and material into the head of the ditch, besides what blows in. An island formed above the head of the ditch
in the river after this crib dam was built. Originally the
772 main channel of the river, after the crib dam was put in, ran
on the west side of the island. As the water would rise in back of the dam it would come over to the east side. There was an outlet into the canal there. This was partially the purpose of build

ing the dam. After the island was formed there was water on both sides of it. I laid the trouble in getting water into the head-gate after a number of years to the filling up of the sand in the river.

I went about a mile up the stream above the original head-
773 gate and put in another head-gate. We got more of a head of water that way. There was a dam put in away above the new head-gate about a mile, I guess, so as to throw the water into the canal. They dug a ditch above the head-gate and left an overflow by the gate, so that the head-gate is about a mile from the point where the ditch actually takes its water out of the river. There was a dam put across at the point where the ditch takes the water from the river, and this ditch now heads right above that dam. That new ditch continues to furnish water for the canal but the water gets scarce at the mills occasionally during the sum-
774 mer. I don't know of any time in the last ten years when the canal has taken all of the water flowing in the river, but I have seen it when the water was very, very scarce in the river.

Most all these mills were built between 1882 and about
775 1887 or 1888. There was quite a boom along in those years. We have gone along gradually since then. There has been a new mill built that was destroyed by fire and was rebuilt within the last five years. It is a grist mill—flouring mill—and uses water for power, and in late years they are using steam sometimes;
776 they get out of water. This big mill has put in steam, and the electric light plant has put in steam. I don't know whether there are any other things that took water since 1890 that didn't take it before that time.

There are some ice gorges here in the canal in the winter. That has a bad effect on the running of the electric light plant when they are working on the water. The big mill put in steam be-
777 cause she didn't have sufficient water to run it. I have seen where they had to shut down for want of water; that was in the summer, I think. In the winter sometimes we have very little water in the river now, if any; the canal takes it nearly all. That was not true when the canal was first built. I should say
778 that the flow has dropped off about one-half in the winter months, and about the same for the summer flow after July
779 and during the early fall. The company moved the head-gate of this canal up the river, I think in 1887. That was not a dry year. The water in the river was not so low as I have seen it since. The ditch had filled up or something had happened so that we couldn't get the water out and we made up our minds to go up above to get it out of the river. It is not true that this canal has become larger by reason of washing than it was when it was constructed, But on the contrary it was filled up. They don't clean it out each season, but they take out some obstructions occasionally.

In 1880 the river was about two or three hundred feet wide where I crossed it up here about Gueda. There was a ferry there too, and

one down here. The ferry boat at Gueda was about thirty
780 feet long and ran on a cable. It was a flat-bottom boat and when loaded with a couple of teams or three or four it would draw about a foot, probably. They got it across the river by running it on a cable and letting the current drive it, and they had no bridge. In 1880 or 1881 I crossed the river down here near Arkansas City and there was no bridge at that point, but there was a ferry. That was below Chestnut avenue, west of here. There is a bridge on Chestnut avenue now near where the ferry was. I should say the stream was a couple of hundred feet wide there when
781 I first knew it. I have never seen anybody ford it there, but I tried it myself on horseback, and came out swimming. That was along about May, and the river was a little on the rise. I think that during the dry season it was fordable there in 1880, 1881 and 1882. The river has always been fordable at points near here during the dry season, as far as I know.

There are four bridges across the Arkansas river in the neighborhood of this city, and two across the Walnut. The bridge that is near where the ferry used to be is about five hundred feet
782 long and I think it was built about 1887 or 1888.

The river along the west side there at the point of the Chestnut street bridge has filled up considerably since 1880. There are sand bars and brush growing on it. The channel itself is not as wide as it was in the '80s. by one-half, in the dry season. It is a little over a hundred feet wide now, because there is more water. Ordinarily there are little narrow channels you can almost step across sometimes in dry weather in the vicinity of the bridge.

Cross-examination.

783 By Mr. CAMPBELL:

The boat that I spoke of on this river that came from the north years ago I think *I think* was in 1880 or 1882, somewhere along here. It went down the river. It was a steamboat. We
784 had the Santa Fe railroad in here then I think. The Missouri Pacific, the 'Frisco and the Santa Fa railroads are here now. I didn't see the boat called the "Aunt Sally." It was loaded here and went down the stream, but never came back to my knowledge. It was loaded at the mouth of the Walnut, at the canal here, as I understand it. That was below where the dam now is. This canal is simply a mill race to furnish water for power purposes for these concerns. No boats ever ran on the canal.

There are six bridges across the Arkansas river near here—two railroad bridges and four wagon bridges. They are eight to twelve feet above the surface of the water. I assisted in putting in
785 this obstruction in the river to turn the water into the canal.

I couldn't tell you what authority they got from Congress or from the War Department for that purpose. I couldn't say

whether any authority or officer of the War Department ever complained of that obstruction in the river.

The county put in the wagon bridges across the river, and I don't know whether the county ever obtained any permission or sought any permission from Congress or the War Department to put those bridges across the river. I don't know as these bridges are much of an obstruction to navigation at present. As a matter of fact, this river is not navigable here at the present time through these bridges. As to whether the river was navigable in the sense
786 that boats could be run on it before these bridges were put in depends on how big your boat is. I have seen steamers that wouldn't go up, and I have seen some that would, but not at all times of the year.

Cross-examination continued.

By Mr. DAWSON:

I think I made this drain here in the slough in May some time. It was along in the summer. The Santa Fe railroad was in here at the time when the "Aunt Sally" was said to have been loaded here, and I don't know whether there was any more or not. I was working for Mr. Hill at that time and he was connected with the milling company. I don't know whether just prior to that time there had been any complaints about freight rates by the mill people or Mr. Hill either in or out of here. The electric light
787 plant has lately put in steam; they were using water all of the time until lately. I couldn't say whether they have used the water also, since they put in steam. I don't know whether the price of fuel is less now than it was fifteen or twenty years ago.

When the Walnut river gets up high enough to back up on the canal, it injures the usefulness of the canal for power purposes and they can't run the mill. When the Walnut river is very high neither the mill nor the electric light plant can get power from the canal, and they couldn't have gotten it this season during the flood. If they had been relying on the canal entirely the electric lighting in the city would have been without any power until the
788 water went down; that would have been four or five days, or six, the last flood this season; that was about July; and almost every year there are times when the Walnut gets up high that way. Even when it doesn't get high enough to absolutely take the power away I suppose it gets high enough to diminish the power very materially and that occurs generally every year, that is, after the water gets to a certain height I suppose it does.

Recross-examination.

By Mr. CAMPBELL:

At the place where this dam or obstruction is when the water is low, there is a fall, I think, of about seven or eight feet below. The dam is made of logs, brush and stone.

Redirect examination.

By Mr. ASHBAUGH:

789 The steam power was put in these mills six or seven years ago because they could not have power enough without it. It was because of lack of water in the Arkansas river. (Objection.) Well, there has been one or two times, one time especially, I have stepped across the Arkansas river when the water was flowing. It has gotten practically dry during the dry season of the year here lately.

The water level that I spoke of being lower in town and at this slough extends back probably two or three hundred feet.

790 The only reason I could give for the water level becoming lower is that the water sank away That is all I know.

791 Taking just the flow of the river in the condition it was, the flow was sufficient here so that I have seen a pretty fair size steamboat pass, but not by the city since the bridges

792 were put in. (Objection.) During the first years that I knew the river, during the greater portion of the year, there was sufficient water in the Arkansas river for small steamers to navigate the river. (Objection.)

The bridges I have been speaking about had no draws in them. I never saw but one steamboat going up and down the river.

793 The Arkansas river is of shifting sands. The channel changes pretty often. I don't know as it changes daily. I think whenn the water falls the channel changes more than when the water is high.

Redirect examination.

794 By Mr. DAWSON:

At the time I stepped across the river the canal had been constructed and it was below the head or mouth of the canal and it was within the last four or five or six years. The canal at the time was taking out water, running its usual head. One of the bridges I have spoken of is below the main portion of the town.

796 JOHNSON KELLER, Arkansas City, Kansas.

Direct examination.

By Mr. SMITH:

I live nine miles south of Arkansas City, on the river. I have two hundred and forty acres of land, eighty acres of it being bottom land and the balance of it second bottom, the second bottom being about twenty-two feet higher than the first bottom. I bought it in the winter of 1884 and 1885. I had owned both bottom and uplands

prior to that near Wichita. From the time I bought my land
797 down to 1890 my principal crop was corn and potatoes and such things.

As to productiveness, my bottom land growed well and gave satisfactory crops. On the bottom land I didn't depend entirely upon the rainfall to make a corn crop; it seemed to make a corn crop without much rain. Being close to the water, it kept the crops alive and matured them, and back on the upland they were burned up. I should judge that there was fifty per cent. difference between the productiveness in corn on the first and second bottom lands,
798 taking one year with another. The bottom lands were selling about double what the uplands were selling for. My experience was that the bottom land produced the best crops. I had had experience in Sedgwick county, and I owned both high and low lands, and I found there was a big difference between bottom lands and uplands in production. The fact is that I quit raising corn about six years ago, because it didn't mature; it burned up. I raise now nothing but wheat, it matures before the drought commences. I had to make this change because it didn't pay to raise anything else. I couldn't raise corn successfully. This change in productiveness on the bottom lands as to corn became noticeable between 1889 and 1891, somewhere along there.

799 I have noticed the flow of the Arkansas river as any person would living right along there. I noticed it going down and getting lower all the time. When I first settled there, when this bridge went out down here, there would be a whole summer we couldn't cross down there, when I first went there in 1884 and 1885. I remember one time when this bridge was out five or six months. Only just occasionally could we cross the river, there was so much water in it. Since then there has been no difficulty in crossing the river any place you wanted to down below me. You could cross almost any place. I should say the diminution is close to fifty per cent. difference in the height of the water. It is my judgment
800 that the flow is not more than one-half as big now as it was formerly. I noticed the diminution as soon as my crops began to fail. The crops began to fail about the time the water in the river began to go down. (Objection.)

I had three springs on my farm, strong, running springs, when I went there, and they kept going. From about 1889 or 1890 they commenced lowering. Two of them fed a natural fish pond that covered about an acre and three quarters that we *rode* around in with boats, and we stocked it with fish of different kinds and it supplied us with fish the year round, and all the neighborhood. Well, it kept sinking away. One of the springs went dry entirely. It didn't show any coming out of the surface, and the two springs that fed this pond kept going down and down until they went dry. The fish all died in the pond. There must have been eight
801 or ten wagon loads of fish in there when it went dry that year. I think that was in 1890. It was the year the Chero-

kee Strip opened, which was 1891. There is no water in that pond now. There have been immense rains in the hills this year and the springs are running, a little weak. These springs are about ten rods from my dwelling. When I first went there I got the water from the spring, but on account of the distance, I sunk a well, 15 feet. That was the second year after I went there. There seemed to be plenty of water in it. It lasted for two years. It kept going down and down, and I sunk it deeper, and it kept on until I went about thirty feet before I could get the same amount of water I did at fifteen feet in the same well.

802 I don't know just what the relative value of bottom land to upland now would be, but it is not considered in the same ratio as it was then. I myself would avoid buying the bottom land, with the experience I have had, even at the same price as good upland is selling for. When I came here the bottom land was the most valuable for the crops it raised. I bought it on account of its greater production, but I would avoid what we call first bottom land now. My land runs right up to the river, about nine miles below Arkansas City. There is an island right near my land and about half of the river is on one side and half on the other. The channels of

803 the river from bank to bank, I can't see but they are just the same, practically, as they ever were, but the volume of water sinks down so that it is a long way from what I call the channel or the banks. (Objection.) The year I bought this place I undertook to drain this pond out. I thought it could be drained into the river, but I found it was too expensive, and I thought I could

804 dig a basin and let the water run into it, but I would dig down four or five feet and come right onto a bottom of water there, and that was pretty nearly level with the water in the pond. I dug right down and it just came up and I found there was no use in trying to drain it in that direction. You can't find water there in dry seasons of—but I don't know how deep that water is, but I have never been able to find that water so close to the top of the ground since that in all the digging I have done.

Cross-examination.

By Mr. HAYT:

I came from the State of Illinois to Sedgwick county, Kansas, in 1876. In Sedgwick county I raised corn, wheat and oats.

805 We had, I think, two droughty years. There were no such droughts as we have experienced since, but there were two

806 years of drought while I lived up there. We raised very good corn, but what I call droughts is shortage of crops.

I moved down the river in the fall of 1884. I didn't own any land in 1884 and didn't see the river that year. I have never kept any statistics of the amount of water in the river at any time.

807 I never made any memoranda of the stages of the water in the river. I never measured it in any way, even by putting

sticks in, only by the depths of the oars when I would be rowing across with a boat. I can state definitely that the water is lower now than during the first two or three years that I was on the river. This year it has been pretty high, a little too high for the good of the country.

Where I planted corn when I first moved down here I think corn had been raised for ten or twelve years on the same land,
808 maybe longer. It was an old farm, and had been farmed a good many years, and that seemed to be the best land for raising corn when I bought it. I have found out by a long period of years in farming that if all the corn stalks and all the things that grow on the land is turned over you can farm it a long time without fertilizing it, and you have never seen its equal in this country or in any country I have ever been in, whereas if the stalks are all taken off and burned it will deteriorate. That is my experience through life. There has got to be something left on the ground or will deteriorate. In this country they generally take it off in some way—either feed it to the cattle or take it away. They take off all they can get as a rule.

809 Down near my place I should say the river banks are about eight or ten feet above the bed of the stream, probably a little more. It runs level right back to the first bank—the second bench—then it rises up gradually, bench after bench, until it gets up higher, west of us. That spring I speak of seems to come
810 right up at the foot of the rocks. In the early times I put a piece of stove pipe up and it ran the water up about one foot. As the springs began to go down we had to lower that, and lowered it until we had to sink a tank in it. That is all the way we can retain water now for the stock, whereas the little trough would water over a thousand head of cattle a day and have plenty in the early times. This spring is near the bluff bank, or near the commencement of the second bottom. I don't think the second bottom would run
811 over ten feet above the first bottom. Now, from my level to get the distance in the well, I think the second bottom is about twenty-three feet above the first bottom. That is what we made it on a level from that spring, and as you go westward it gradually rises. The second bottom is probably 160 rods wide, then we come to a rough, broken tier of land. It is about the usual run of lands in this section of the country. That gradually sloped down toward the spring. These springs are about ninety rods from the river, I should judge; they are on higher land than the bed of the river, and higher than the water in the river at an ordinary flow, I should judge.

812 I never completed that drain that I have spoken of, because it was too expensive. I abandoned it. The water disappeared, and it is not necessary to go to any further expense in draining. I commenced this drain in the spring of the year, some time after corn planting, probably in May or June. I have testified that I paid

twenty-two dollars and a fraction an acre for this bottom
813 land. I have fixed the price for the bottom land and the price for the upland, the two in conjunction, in making this price. In my experience the bottom land would not be worth any more than at that time, although land has advanced. To put it back in the same state of improvements it was in when I took it, it is not worth any more in conjunction with the other. I have improved the upland very materially so that I can't make any comparison between the price as I got the land and what it is now. It would be worth three times what it would be then with my orchard, so that I could not tell just exactly what the ratio of value would be at the present time compared with then. I have not put any
814 improvements on the bottom land. I have cropped it all these years; it has never been idle. I can't hardly determine whether it has held its own in price or not. It would be hard to sell it for what I paid for it—very hard. In my judgment it is not worth as much as what I paid for it, my actual judgment, with the experience I have had. I will sell it to-day for $42 an acre
815 if anybody wants to come down and take it. I don't think this land is higher in value than it was at the time I purchased it. We have had years when land values were away up and purchasers were abundant—boom years. But the boom was not very bad the year I bought. Lands went up since a great deal higher than they were then. I bought after the boom had busted. I didn't go to the highest point, quite, I don't think. I think I bought pretty nearly on the top of the bubble, if I remember right.

In the flood of 1904 my bottom lands were covered with water, just about deep enough to run a little row boat over them. I
816 didn't sustain any loss. The flood didn't make me afraid because I have seen the lands flooded before. It overflowed once twenty-seven years ago a little. At this time, in 1904, it overflowed a trifle more. It is a pretty hard question for me to answer as to whether or not the flood of last year decreased the value of the land or rendered the selling of it less profitable. From a
817 fertilizing point of view it has raised it, in my estimation, considerably, because there is enough fertilizing in that to last for the next ten years. I don't know whether I could sell it as readily now as I could previous to the last flood. I don't try to sell and don't investigate the value of land. It is not in my business and I don't hear anybody say anything about it. In 1903
818 we had a little flood. I have heard considerable about the flood of 1877. In this country it was not as high, not by a foot, as the flood of 1904. I have a standard of measuring that. At high water mark this year the water covered pretty nearly
819 eighty acres of my farm. The average depth was about two feet. When I first went there the average depth to water on
820 the bottom lands was about twelve to fourteen feet. When I first purchased this land I didn't rely entirely upon the rainfall for the growing of crops. I expected the bottom land to raise

my crops without much rain, from the experience I had had in Sedgwick county. I owned a good many farms, both bottom and high lands.

I can't say how deep corn roots usually go into the soil. They will go pretty nearly to the water if they can't find it in any other way. It depends on the kind of soil. In sandy soil they go very deep. In land that has a hard pan under it, it is a crop that grows shallow, near the surface, as a rule, but in sandy soil I think you
821 can trace corn roots down six or eight feet, right straight down, but it has got to be very loose soil. This depth is not very usual in sandy soil. In this locality the corn roots can't go down in the uplands, but in sandy soil they will go down. I think my corn in the bottom lands got a certain moisture there that it couldn't get if it couldn't go down. I don't think the roots would go down fifteen feet.

Redirect examination.

By Mr. SMITH:

On the second bottoms it is about twelve or fifteen feet to water. The second bottom is about 22 feet above the first bottom.
822 I should judge, without actual knowledge, from what little I dug in trying to open up this drain on the first bottom, that we struck the underflow of water at about six or eight feet. The soil of the first bottom is what is known in this country as a
823 sandy loam. I have dug down in wells right alongside of wheat fields and I have traced wheat roots right down six feet into the ground, by actual measurement. I can't say where the water came from that fed those springs, but the springs failed as the water in the river lowered. The rainfall didn't affect the flow of the springs only as the river rises. It seems to come from
824 the river. I don't regard my bottom land as worth any more, if as much, as when I got it. If we got the sub-irrigation now that we did in the early years it would affect the value of the land materially, if it produced the same as it did the first five or six years, and the experience I had in Sedwick county. The value of the land then would be diminished as compared
825 with what it is now without the sub-irrigation. Lands in general have advanced in price. The lands in the bottom of the Walnut river in some respects are about the same as mine, but the nature of the soil is so much different it won't produce the same kind of crops as mine. The falling off in the production in my bottom lands I laid to lack of moisture and not to the fact that it had been cropped from year to year.

Recross-examination.

827 By Mr. HAYT:

I mean it was six to eight feet to water on the first bottom and twelve to fifteen feet to water on the second bottom, and the
828 second bottom was from twenty to twenty-two feet above the first bottom, but where that water came from I don't know. The water in the springs might have come down hill. I can't say whether it came from the uplands. When I located down the river from this point the second bottoms were cultivated in corn, wheat and such things. The lands still farther back were cultivated but very little. They were not farmed much at that period. They have broken up a great deal of the land on both sides since then. They have extended the acreage under cultivation.

829 Redirect examination.

By Mr. SMITH:

On my first bottom lands at from six inches to plow depth you would find moisture, and it kept getting moister and moister all the way down. The ground was moist all the way down until you got to the water.

830 JOHN MYRTLE, Arkansas City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived about two and a half miles south-west of Arkansas City since 1883. I have been acquainted with the Arkansas river since June, 1871, through Sedgwick and Cowley counties. I can't tell just what the average flow of the river was during the dry season for the first fifteen years that I knew it, but it was much
831 more than it has been of recent years. During the last five or ten years during the dry season of the year, on an average,
832 it has been much lower, a great deal lower, than it used to be. We haven't near the water that we used to have along in the '70s and up until along in the '80s. I live below the mouth of the canal, and of course that makes some difference in the river, but there are times that it scarcely flows—that is, an overflow. I suppose there is an underflow; but it scarcely flows at all. And a good deal of the time I have seen it that way, for a number of years. This diminution took place along about 1888 or 1889, somewhere along there, I don't know just exactly when. It seemed to be rather gradual from some cause. Above the mouth of the canal the average flow during the last few years as compared with the aver-
833 age flow during the dry season the first years that I knew it has been much less, from what I know. I am not as well

acquainted with the river above the canal as some, because I haven't frequented that part so much as below, but from what I know I know it is less, and I am satisfied it is a great deal less.

Cross-examination.

By Mr. DAWSON:

Where I usually cross the river it is three or four miles below the head of the canal. I have been on the river above the head of the canal, but I don't know how many times. I suppose I have
834 been there two or three times. But in coming to town from my place I invariably cross the river below the canal. I usually cross it on the bridge, but if the bridge is out of fix I cross it on the river, but it is much more pleasant to cross on the bridge. I commenced to notice the falling off of the flow of the water in the river in 1888. I presume the canal was constructed about 1887. They first built a dam, and then afterwards they built a dam
835 away above, some miles. I think the dam was moved up the river after 1887 or 1888. When I first came here we had to ford the river; we had no bridges. We sometimes ferried it. The winter flow has been a great deal less for the last ten years as compared with the first ten years that I knew the river. I should say it was fully one-half less than when I first knew it, or more. The summer flow has been nothing like the flow during the earlier years, except, of course, during the floods. This season has
836 been an exception. In 1877 there was a tremendous flow in the river—the flood year. I remember that 1874 was one of the driest years we ever had on the river, but I was away in the time of the high water in 1874. I was on the survey in the Indian Territory. I saw the river probably in August, 1874. I don't remember how I found it then. Of course it was pretty low—for I know it was a very dry season—grasshopper year.

There is a good deal more of this country under cultivation now than there was the first few years after I came here. There
837 were some of the uplands broke in 1871 when I came here, but not a great deal. It was about 1874 or 1875 that we got the craze here for breaking the country up, the fact that wheat sold for a good price, $1.25 per bushel in Wichita, and we found we could raise a good crop. This country and the country about Wichita were both settled about the same time. I suppose Wichita was a little first because they had a railroad there. They were near a railroad. It is not a fact that a large part of the upland country lying back a number of miles but which drains to the Arkansas river was not put in cultivation until along in the later '80s. This was not true of the lands adjacent to this place.

839 I. H. BONSALL, Arkansas City, Kansas.

Direct examination.

By Mr. SMITH:

I live in Arkansas City, and came here on the 23rd day of July, 1872. I have been a photographer for several years, and previous to that a civil engineer. During the time I have been here I couldn't help but observe the Arkansas river. I used to be down about the river previous to 1884 a great deal. The average flow of the river in the dry season during the months of July, August, September and October, during the last ten years, as compared with the same flow for the same months during the first ten years that I was
840 here is about one-quarter of the amount flowing to what it used to be. Just previous to 1884 I was so situated that I didn't see the river at all for quite a while. I had a sick wife and I had to stay very closely at home every spare moment I had. I began to again notice the river about 1886 or 1887 or somewhere along there. I am noticing it now every day—every little while. I noticed it at one time when I was going with a man down across the river here on a matter of business, and I says "What is the matter with this river?" I says "There is nothing but a little creek to what it used to be." And the man says "Why, it has been that way now for a year or two." That was about 1887 or 1888. (Objection.)

I wrote the article entited "Navigation of the Upper Arkansas River," found in the Biennial Report of the State Board of Agriculture of the State of Kansas, volume VI, for the years 1877
841 and 1878, on page 159. The article as it appears in that volume was true at the time it was written. On the next page (160) there is a cut from a photograph that I made of what purports to be a steamboat—the "Aunt Sally." I have the photograph in my pocket. (This is Complainant's Exhibit A–6, introduced in evidence.) The steamboat at the time the photograph was taken was right east of us here in the Walnut river. It came up the Arkansas into the Walnut from Little Rock under her own steam. She made one trip and went back again. I was the
842 means of getting her up here. That steamboat landed here on Sunday, June 30, 1878. I was the only one that got
843 the "Aunt Sally" up here. I had a scheme on hand to try to make the Arkansas river navigable. The appropriation was gotten entirely by me through letters to Ingalls, Ryan and Plumb. I have got the letters down in my room somewhere, but couldn't find them. I was going to bring them up. Mr. Ryan is the present assistant secretary of the Interior. He was a member of Congress at that time representing this dictrict. The
854 "Aunt Sally" was, I guess, about 125 feet long. I have it in that article. (Objection.)

The said article is in words and figures as follows, to wit:

Navigation of the Upper Arkansas River.

The question of utilizing that vast, though ever changing current of water, known as the Upper Arkansas river, flowing through our State from west to southeast, making it a highway to a southern market, has been a living subject with the enterprising agricultural people of Cowley, Sumner, Sedgwick and those counties lying along and contiguous thereto, ever since the first settlement of that
855 fertile valley in 1870. Owing to their remote distance from a railroad or a market and the consequent cost of transporting the vast surplus of wheat raised in Cowley and Sumner, has this matter been of vital interest to the people living within their borders. The subject has been discussed in the fields and in the grange; has been the slogan of the country politician and the shibboleth of the farmers. It has been resolved upon by conventions, petitioned for by representatives and memorialized by our State legislature until Congress has taken the matter under consideration, and appointed a commission of competent engineers to personally visit, examine and report on the feasibility of opening up the stream for navigation, from some point near the terminus of the Wichita branch of the Santa Fe railroad to Little Rock, Arkansas.

In view of these facts, a brief account of the local and individual efforts to solve the problem will doubtless be of interest. During the fall of 1875, A. W. Berkey and A. C. Winton of Cowley county built a small flat-boat at Arkansas City, loaded it with flour and started down the river bound for Little Rock. While they may not have had the "unexplored wilderness" that lay between De Soto and the dream of his ambition, or the dangers that beset Coronado in his march of disappointment through undiscovered Kansas, to encounter yet four hundred and fifty miles of an unknown
856 river, guarded by a semi-barbarous people, who have no particular good feeling towards a frontiersman, lay between them and civilization, presented anything but a cheerful outlook for this pioneer voyage. The trip was made, however, without adventure and in a reasonable length of time. The produce disposed of, the navigators returned overland to Arkansas City and reported a fair depth of water and a lively current from the State line to Fort Gibson.

On the strength of this report, a joint stock company was immediately organized and an agent appointed to proceed at once to the Ohio river and purchase a suitable steamer to ply between the points named. A light draught wharf packet was procured and a point known as Webber Falls, between Little Rock and Fort Gibson, reached on her upward trip. Here it was found that her engines were of insufficient power to stem the current, so she was taken back to Little Rock and there sold at a loss to her owners of twenty five hundred dollars.

This failure temporarily dampened the ardor of even the enthusiastic commercial path-finders and nothing further was attempted until the summer of 1878, when Messrs. W. H. Speer and Amos Walton, two leading public spirited citizens of the county, equipped a "ferry flat" with a 10 horse-power threshing machine engine, and by several trips up and down the river for a distance
857 of 60 miles from Arkansas City, demonstrated beyond a doubt that a steamer could be successfully propelled on the Arkansas river at any season of the year. The flat was fifty feet long, sixteen feet wide and drew ten inches of water. This novel little craft visited Grouse creek, the Walnut river, Salt City, the Kaw Indian agency, Oxford and other points along the river and attracted crowds of people wherever it went. At Oxford a public reception was tendered its officers and crew. These experimental trips were all made while the river was at its lowest stage and prior to the annual "June rise."

Soon after this, and while the "ferry flat" was still prominently before the public, Mr. I. H. Bonsall, an experienced engineer and prominent citizen of Arkansas City, corresponded with the business men of Little Rock, and induced them to send a boat on a trial trip to the upper country.

The little steamer "Aunt Sally," a tug built for the deep, sluggish bayous of the Arkansas, and used in the local cotton trade there, was selected and manned for the purpose. Though not designed for swift water, this crude little steamer made the complete voyage, and in command of Captain Lewis and Baker, with Mr. Chapman as pilot, landed safely at Arkansas City, and was moored there
858 in the Walnut river, Sunday morning, June 30th, 1878. The officers reported sufficient water and a safe current for light draught steamers for the entire distance, and expressed themselves of the opinion that a boat built especially for the purpose could run regularly between the two States every day in the year.

Soon after the "Aunt Sally" returned south, Henry and Albert Pruden and O. J. Palmer of Salt City, Sumner county, started for Little Rock with a "ferry flat" loaded with seven hundred bushels of wheat. The wheat was sold at a good round figure, and the gentlemen returned, reporting a successful trip and a good stage of water.

On their return, the business men of Arkansas City, finding that steam-boat owners in the lower country were not disposed to adventure up so far with their boats, resolved to build a steamer themselves and with it make regular trips between their city and the Indian agencies at the Territory. After several attempts to find men of experience to take the matter in charge, McCloskey Seymore secured the services of Mr. Cyrus Wilson, who began the building of a boat for the purposes named. Wednesday afternoon, November 6th, 1878, the "Cherokee," the first steamboat ever built in Kansas, was successfully launched at Arkansas City.

The hull of this boat is 83 feet long, 16 feet wide on the bottom

and 85 feet long and 18 feet wide on the boiler deck, beam,
859 22 feet, with guards extending 2 feet around a model bow. She carries two twenty-horse power engines, and with all her machinery, draws less than eight inches of water, when loaded to the guards, will not draw over sixteen inches. The shallowest water found on the bars between Wichita and Little Rock, during the lowest stage of the river, was eighteen inches. From this, it will be seen that the "Cherokee" will answer the purposes for which it was built, and be of great service in transporting the supplies from these counties to the Indian agencies lying south and east of Arkansas City.

With the Arkansas river opened for navigation, and a good line of boats and barges making regular trips between the points named in this article, business of all kinds will receive a fresh impetus in southern Kansas. There will be no railroad monopolies, no "pooling of earnings," and no forming of combinations to affect the interest of the producers. The farmers of this remote locality will then have a highway of their own by which they can exchange their surplus wheat, flour and corn for the coal and lumber of the lower Arkansas. The advantages of this proposed line of commerce are apparent and need not be repeated here. The attention of Congress has been called to them, and we patiently await the official report of its commission on the subject of navigating the upper Arkansas river.

860 I was a passenger on the "Aunt Sally" on that trip part of the way down, about fifty miles. At that time the Atchison,
861 Topeka & Santa Fe Railway Company was opposing the plan of navigating the Arkansas river. The "Aunt Sally" was not built here. It was soon after the "Aunt Sally" came up here that they submitted the proposition to bond this county for $124,000 to build the railroad down here. The road was at Wichita
862 then. I saw one boat built here; it was called the "Cherokee." It was built and launched here, right across the river. It was 125 feet long. It went down the river with a load of wheat. She didn't come back. About that time the railroad came through here. There were some small flat-boats built here and went
863 down the river with loads. (Objection.) This was about November, 1878. There were several boats that were completed up here. The Pruden boys had a claim right across the river, and they put on several hundred bushels of wheat on a barge that they built themselves and went down and sold the wheat below. I was not with them, but I think they sold it at Little Rock.

864 Cross-examination.

By Mr. HAYT:

I have described all the boats that I saw on the Arkansas river at or near this point, and I never saw one of them here after 1878. I never knew one of them returning to this point after it had gone

down the river. The article that has been shown me, from pages 159, 160 and 161 of the reports of the State board of agriculture of the State of Kansas, was written by me, about three-fourths of it. Afterwards it was changed by Wirt Walton, and then he, Walton, claimed the credit for having helped to write it. The things
865 I wrote about were true at the time, but as to the matters that Walton added, most of his statements were not statements direct. They were flowery stuff that he put in there. He was embellishing the article, putting on the finishing touches. He was drawing on his imagination somewhat. I can easily pick out what I wrote in it.

The Atchison, Topeka and Santa Fe railroad didn't want
866 navigation on this river, but I can't tell on oath what they did to prevent it. We have every reason to believe that it was the Santa Fe railroad that interfered with the project. We had trouble in going down without a load. I think the pilot was under the control of the railroad company. The pilot and the captain owned the boat, and they were undoubtedly paid to go down without any wheat in order to discourage the scheme of navigation. I don't know this of my own knowledge. At the time, this running of boats up here was somewhat of a hobby with me. This boat that I have spoken of went down empty. It went down without
867 any trouble whatever. It was another boat that had difficulty in going down; that was a boat that we built up here; we had no particular name for it. It was a ferry flat, and drew about two and a half feet of water, and went down empty.

The "Aunt Sally" came up about July 1st, 1878, and we ran excursions up and down the Walnut at the time I took that picture (referring to Complainant's Exhibit A–6). The boat could
868 run up and down the Walnut now. There is water enough there to run it now. It don't rise in Colorado. We didn't bring the "Aunt Sally" over in the Arkansas river next to the town at any time. When they came up they entered the Walnut river; they didn't go up the Arkansas. This boat never came back
869 after it went down. The people shown as on this boat in this picture (Ex. A–6) were simply on the boat to enjoy themselves in riding up and down the Walnut river. It had nothing to do with the Arkansas river. The barge the Pruden boys built,
871 as near as I can recollect, was about 25 feet long and 16 feet wide. Another barge, loaded with wheat, built by another party, was about the same size. We called them ferry flats. These ferry flats drew about four feet of water. I guess the Cher-
872 okee would draw only fifteen inches. About the time these boats went down the Santa Fe railroad was built into Arkansas City and there was no attempt to navigate this river after that time that I know of.

I guess I am the father of the movement for getting appropriations from Congress for the river. The scheme was not in politics, and as far as I know it was not an issue in any of the campaigns in

which Tom Ryan was a candidate. The amount of that appropriation was $30,000, and it is the only appropriation that I can recall.

Cross-examination.

By Mr. CAMPBELL:

I don't know that Congress appointed the commission referred to in the article which has been put in evidence. I know some
874 engineers came out here after that and came down the river in flats. They measured the flow and the width of the river and calculated the water that was passing, and the current—the speed of it—and made their report to Congress. I saw the men when they were here. This was after I wrote the article referred to. I know that that board made a report to Congress. I can't remember the date. The substance of that report was favorable. I only know this from letters that I would see at the time. I don't remember whether I saw this report or not, but I saw a report communicated to me from the engineers in charge of this work at Little Rock. After that they spent fifteen thousand dollars between here and Wichita, after this report was made, and after the appro-
875 priation was made. I don't know as a fact that any appropriation was made by Congress after those engineers made their report.

Redirect examination.

By Mr. SMITH:

I had communications constantly with the engineer at Little Rock in reference to the navigability of the Arkansas river. He wrote to me and asked me to give him my idea as to the amount of commerce we could furnish on the river that would be worth
876 while to make improvements. (Objection.) I wrote to the county clerks and got that report and sent it to Congress. (Objection.) It was after that that the $15,000 was spent between here and Wichita. (Objection to introduction of Exhibit A–6.)

843 W. M. SLEETH, Arkansas City, Kansas.

Direct examination.

By Mr. SMITH:

I have lived in Arkansas City for the last thirty-four years. My business is looking after the land improvement company, the gas and electric company, the street railway company and the water power company. I have been connected with the water power company ever since it was built in 1885. The water power plant consists of a ditch and a dam and a tail-race that discharges the surplus

water. The dam is northwest of the city about three and a half miles, across the Arkansas river. We get our water for the canal from the Arkansas river. The canal when it was first built
844 was about 15 feet wide on the bottom, with a slope of two to one on the sides, but it is larger now in places. It furnishes power for the flouring mills (objection) and the electric light plant, the Kirkwood wind engine factory and then the chair factory. The water plant furnished sufficient power for these mills and factories at that time. All of these that I have mentioned except the chair factory depend upon the water power. The chair fac-
845 tory has not been operated for several years. There was a planing mill, but it has been moved away. During the last ten years there have been times when the plant furnished an insufficient power to these mills. The electric light plant is running nearly all the time; the flouring mill had to stop because of lack of water to furnish power. I don't believe any of the other plants stopped for the same reason. The flouring mill is the one that consumes the greatest amount of water power.

I have had occasion to observe the flow of the river from 1885 to the present time. I have seen it almost daily. In the last ten years as compared with what it was in 1885 there is a shortage. I couldn't say just how much. There has been less flow es-
846 pecially in the summer and fall months. The canal has frequently carried the full flow of the river during the last seven or eight years. It didn't do it to my knowledge in 1885. It has been within the last ten years, I would say, that we began to notice the lessening in the flow of the river and the consequent decrease of power in the plants. This was somewhere about 1890. I should judge the flow of the river to be about one-half as large as formerly, though I am not certain. I couldn't tell. We are short of power in this plant about one-fourth of the time, I should say. We supplied this shortage of power by an engine there, or did until it burned out a year or two ago, and we used that for the flouring mill.

847 Cross examination.

By Mr. DAWSON:

We moved the intake of the canal farther up-stream, I think in 1887. We did that because we thought it was a better place to make the head-gate and dam there than we had below here. It was rather hard to maintain the old dam, and we can maintain it more easily where we now are. We have a rock foundation where the head-gates are, and there is a bed rock across the river there.
After we constructed the canal in 1885 these various institu-
848 tions of which I have spoken commenced to take power. They didn't all come in at once. There were two large flouring mills, and then the wind engine factory, and then the chair factory, and then the two large flouring mills were merged or con

solidated into one. We reached the maximum of power using institutions in about ten or twelve years, I should judge, after the canal was constructed. It was about 1894 or 1895 that we got the maximum. We had plenty of power for all these up to that time. It was after that time that the power began to get short. None of these concerns that I have spoken of quit using the power entirely.

They use steam also. The flouring mill uses steam part of
849 the time. It was the only one that used steam. It was the largest consumer. It continued to use some water power. It uses the water power whenever there is a sufficiency of water. The water is generally sufficient in the summer. Sometimes the ice interferes in the winter, but not very much. It was not on account of the ice interfering that they put in the steam power; I think it was on account of the insufficiency of water. The ice don't last very long, only a short time, in the winter season. I don't think they ever used the steam power more than once in the winter season on account of the ice. I don't think they have got any steam in now at all, but they did have it about I guess five or six years, up to the time they burned down a year ago last June, and they haven't put this steam power in since, although the mill has been rebuilt, and they are again relying on the water power. The electric plant relies wholly on the water power. They are now putting in
850 an engine. It is not yet in operation. That is the electric light plant that furnishes the city lights as well as the custom lighting of the town. There have been times when the ice bothered sufficiently so that it would affect the lighting here in winter; not very long, but there has been a time or two, I think a night or two, perhaps, in the season, that it might blockade, you know. You couldn't get the water through.

When the Walnut river is high it very much diminishes the effectiveness of the canal for power purposes. It shortens the head, and that is apt to occur during the spring or summer months. It sometimes exists for a day or two at a time but not for weeks
851 at a time. I don't think it ever, to my recollection, existed for a week at a time. It has existed to such an extent as to affect the lighting of the city, and we think that to be assured of light at all times it is necessary to supplement this water power with steam, and that is what we are doing, and the same is true of these other institutions that have supplemented the water power with steam.

I think the flow of water has diminished during the winter months from December to March, both inclusive, during the last ten years, as compared with what it was when I first knew it. The diminution is about in the same proportion as in the summer months.

Redirect examination.

By Mr. SMITH:

During the first six or seven years that we were running that plant the high water in the Walnut river affected it, if we had
852 any high water, I don't know how much high water we had. It diminished the heads. We had more water from other sources, you know, than we afterwards had. The principal reason for supplementing water power with steam was to have power to run the plant. I suppose the shortage of water was the principal consideration for supplementing with steam, more than anything else. The shortage of water affected us for longer periods in the fall of the year. The canal was dug, I think, in 1885.

878 L. E. WOODIN, Arkansas City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Arkansas City continuously since 1890, and was around here from 1882 to 1890. I was in the Indian Territory, in the Indian service, and at Winfield and other places, and was
879 here just off and on. My people lived here. During the first ten years after 1882 the river sometimes was very deep. I don't think I ever crossed it when it was as low as it has been for the last ten years. I crossed it a great many times because my business was down here at the bridge, and I always forded it. The average flow of the river during the last ten years as compared with the flow during the first ten years has been considerably less. In the early years I crossed the river repeatedly, and lately have seen it constantly. I was acquainted with the canal when it was built here. In 1890 I became assistant secretary, and two years afterwards I was secretary of the Arkansas City Water Power Company, up to February, 1901. The canal is, I think, about five miles
880 long, with a fall of 21 feet. It was built for the purpose of running the water from the Arkansas river into the Walnut to run the mills at the foot of the canal. The mills that were built on the canal were: The Arkansas City Milling Company; the Roberts planing mill; the Kansas Mattress Company; the Arkansas City Gas and Electric Light Company; the Kirkwood Wind Engine Company, and the Plummer Chair Company. (Objection.) They all used water power. Those that are left there are using water power, except the milling company, which is using an auxiliary steam plant during the dry season. Frequently
881 during the last few years they have had to use their steam plant because of low water. I think we noticed the diminution in the flow of the river more materially along about 1893 or 1894. It seems to me that that is the time when we began to be

alarmed about the shortage of water. Below the mouth of the canal during the dry season of the year the Arkansas river has practically no flow. We stop every drop from coming down. The canal varies in width from twenty to perhaps thirty feet wide. It has a big current. In the dry season it would take the entire flow of the Arkansas river. We don't let any of it go to waste. The falling off of the water in the river affected quite materially the receipts
882 from the sale of power from the canal. (Objection.) It was a material difference.

Cross-examination.

By Mr. DAWSON:

I am now superintendent of the water works. I think the canal has considerably more fall than the river at this point. I
883 don't think I ever saw the river practically dry in the '80's. We could ford it a good many times without swimming the horse. At the lowest times it would come about up to the buggy bed: at such places it would be about 200 feet wide, I presume, and
884 it would be nearly the same depth all across. My judgment is that the falling off in the last ten years has been about one-half. I never measured it. I wouldn't swear to it. This does not apply to the flow of the water in the river during the winter months. The river seemed to be normal during those times. I have never paid very much attention to it during the winter. I have paid much attention to it in the summer outside of the point where our canal comes out. I put a fish-way in there. They compelled us to put the fish-way in, but there was no water in the river for the fish to go up and down.

When I spoke of the plants that were left using water I referred to the fact that one burned down and one has discontinued.
885 There are three, and one has just moved up-town now. The reason for installing auxiliary steam pumps was purely on account of low water, not an account of the ice. The ice never stopped running the plants very much. We would let the ice freeze over, and the water would run under the ice. Sometimes the plants using this canal were also bothered by the high water in the Walnut river robbing the canal of its power. I don't think this had had any effect in bringing about the installation of the auxiliary steam plant. The milling company was the only company that put in a steam plant. It was the electric light plant and the others below that were bothered with the back water to the Walnut. The water would back up and there wouldn't be water enough to cover the wheel.

887 ALBERT H. DENTON, Arkansas City, Kansas.

Direct examination.

By Mr. SMITH:

I live in Arkansas City, and was born three miles southeast of this city in 1872. The farm where I was born cornered
888 about fifty yards from the river. It was bottom land. During those years I saw the Arkansas river frequently—I suppose every day. The average flow of the Arkansas river during the dry season—July, August, September, and October—for the past ten years is not over a quarter as large as the flow during the same months in the '70's and early '80's. We could go swimming in the river during the dry season, or August and September, and the average depth of the river during those months in the '70's I
889 should think was two and a half feet. The average depth now *was* not over 15 inches. During those months in the '70's the river was never totally dry. We always expected high water in June and always had it. Such rises are not often now. In those days we crossed the river by ferry, by fording, and by the bridge.

Q. How was it as to being forded? Could you ford it anywhere? Answer. No, sir, not generally.

My father owned a farm there of about 600 acres, and in 1879 he sold considerable wheat to a miller on the Walnut river,
890 about 2,000 bushels, and we boated it across the river, in a skiff, in sacks, and hauled it to the mill. This was in the first half of September, 1879. During the late years I don't think it would be possible to do that. I have seen people cross the river on horseback at most all depths. I have seen them swim the river and I have forded it myself when it was only medium size or belly-deep. I have seen the horses when they were forced to swim. It wouldn't swim a common fox-terrier dog the last few years during the dry months, and especially toward the latter part of September.

891 I remember that in the '70's a well was put down on my father's farm. We got water then at a depth of 53 feet. Later than that the well went dry. We put in a pump—drove it down in the sand about six feet. Then the pump gave out and we drove the point of the pump about ten feet farther down in the sand and got a good supply of water. This was 16 feet lower than the bottom of the first well. The well when we dug it first 53 feet deep had about four feet of water in it, I think. It is on the
892 side of a hill, about half a mile from the river.

In the '70's bottom corn was always considered much better than corn on the uplands, because of better land, and we thought we had some benefit from the underflow from the river. I think

the bottom land is better yet, but we haven't as good crops as in the early years.

Arkansas City is four miles from the Oklahoma line.

893 Cross-examination.

By Mr. DAWSON:

I lived on the farm up to 1892. I am now 32 years of age. We owned 200 acres. All but thirty acres were bottom lands.

894 The house was on a slight elevation from the bottom land, and the well was sunk near the house.

There was considerable high land back of us. This for a

895 distance drained toward the river, I presume for a mile and a half back. In the '70's a portion of the high land was under cultivation. There is more of it under cultivation now. I presume that in the '80's it would reach the maximum, that is, the general average. I think our house was 50 feet above the

897 river. When I speak of the first bottom I include lands fifty feet above the river. I think the average height of our bottom land was approximately 20 feet above the river. It was the accepted notion that the underlying sheet of water was on a level with the water in the river.

898 I think perhaps corn roots extend into the grouud *wo* as to derive benefit from water lying twenty feet underneath it. I don't know how far a corn-root does go down. I understand that alfalfa goes down 15 or 20 feet. I understand that if water is 20 feet under the surface of the land the moisture would come up through the ground to quite a little distance by absorption. So far as I know, the water level under this ground is the same as it formerly was.

We are now raising more wheat than corn, and have about thirty acres of first-class alfalfa. I know of one field in our neighborhood that had corn on it, nothing but corn, for I think 22 years.

899 The neighbors said it showed deterioration by reason of running the same crop on it. My judgment is that it was worse for wear. I am acquainted with the Arkansas valley through this (Cowley) county, and I think on the average it is about a mile and a half wide, the immediate first bottom. My estimate is that it is from 15 to 20 feet above the normal flow of water in the

900 river.

I expect it is a fact that a ploughed field will absorb more water than prairie or grass land. It depends on whether it

901 is a beating rain, or a drizzle, as we would call it. As I said, I think the river doesn't flow during the dry season more than one-quarter of what it was in the seventies. I am speaking of it more particularly below the intake of the canal; I don't

902 know much about it above. This place of my father's was below both the canal and the Walnut, and the place where the grain was taken across was below the mouth of the Walnut. The

Walnut is a constantly flowing stream but it gets pretty low sometimes. I think it flows as much water now as in the '70's. It is a short, local stream. I don't have any recollection of the condition of the Arkansas river in 1874. My knowledge of the flow of the
904 river and of the crops prior to 1880 is not very distinct or accurate. I was only a boy about eight years old in 1880. My experience is that during the earlier years there were only a few months in the year that we could ford the river, and from 1890 to 1898 there were only a few months when you could not ford the river. From December to March I think the flow is only about one-half of what it used to be. I think the values of bottom farming lands along the Arkansas river in this county were higher than they were fifteen or twenty years ago. There has been a steady and general increase in values, I think.

Cross-examination.

By Mr. CAMPBELL:

905 There is no difference between "first bottom" and "first bench" as I used those terms.

Redirect examination.

By Mr. SMITH:

906 The increase in farming lands has not been confined to bottom lands but is general all over the country. This has been caused by the increase in population and the demand
907 of the people for farms. There has been a larger demand—more people with money. The high price of land in the East has raised our values here, because people have sold their land there for higher values and come here and the land appears cheap to them at $40 or $50 an acre when they can sell theirs for $100 to $125 an acre.

I saw the bridge go by when it washed out in 1877.

Recross-examination.

By Mr. DAWSON:

908 The period of the greatest population in this city was in the beginning of 1893. The excess over the present population was in the neighborhood of 3,000 besides a very large transient population that came in here for the opening of the Cherokee Strip. A large number of our farmers along the south
909 line of Kansas went to the Cherokee Strip, and I am not able to state whether the population of the county was larger in 1893 than it is now or not.

910 JAMES BENEDICT, Arkansas City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Cowley county, just across the river south of Arkansas City. I came here in the fall of 1870 and located in Arkansas City and was in the hardware business. I preempted land on the Walnut, and have owned other lands in different parts of the county and now own a small piece where I live across the river. It is upland and about half a mile from the river. I think the bottom lands are about ten feet above the level of the river, on an average, and in the lowest places it probably would be two or three feet above the water in the river.

912 In the early days I have crossed the river hundreds of times, but not so much in the later years. I think our first bridge was built about 1874 or 1875. Before that time we forded when we could and ferried most of the time. We ferried most of the time because the river was too high to ford, and we always considered the Arkansas river a treacherous stream to ford in the very best time, for freight. During the dry season, excluding the months of May, June, and July, I was almost afraid to ford the river on account of deep water. I never had any trouble in ford-

913 ing it except once, in 1877 I think, or 1878. I think it was in August. At that time the water came onto my pony's back, about the saddle, so that I had to draw my legs up and put them on top of him to keep them out of the water. The water might have been higher than the average, somewhat. I think the river would average perhaps three or four hundred yards wide at that time, and on the average I think it would be to the lower

914 part of the bank all the time, and would average 2½ to 3 feet deep. During the last ten years we haven't had near the water we had the previous years. From appearances I would estimate it at about ⅓ to ½ of what it used to be, excluding the months of May, June, and July, and excluding high water. I mean that it is ⅓ to ½ now in depth and width, not taking the current into consideration. (Objection.) The diminution in the water became

915 noticeable, I think, in the latter part of the '80s. There was formerly a well here in the years 1870 to 1880, on Fifth avenue, running east and west toward the Santa Fe depot. That well went down; that is to say it caved in, for a depth of perhaps 30 feet across the top. Afterwards Mr. Fitzpatrick wanted to supply the town with water for sprinkling and dug a well as near as he could to that old well. I told him where to dig to find the same vein of water and he struck no water there that he could use at all. There was no water there. In the early years you could look down and see water pouring through there like a mill race. That water

was not there when Fitzpatrick bored his last well. This well caved in about 1878 or 1879.

916 I crossed the Arkansas river in the spring of 1871 in a ferry boat owned by Mr. Speers. That is the first time I ever crossed the river. I think the first bridge was built in 1874. That bridge went out at the June flood of 1877.

917 I remember the boat called the "Aunt Sally." It came from Little Rock up here. We ran an excursion all day on
918 the Fourth of July. I collected the fares all day on the Fourth of July on the boat. The boat was crowded every trip it made. It stayed here probably a week and then went down the river, I think to Little Rock. It was brought up here to see whether the river was navigable. I invested about $200 in the "General Wiles." That boat was built in Ohio and started to come up here, but the engines were not powerful enough and they never got any farther, I guess, than to Fort Smith. The "Cherokee"
919 was built here. It was perhaps 50 or 60 feet long. Its power was a theshing machine engine on it, but I don't know its capacity. It had steam power and was intended to run up and down the river with wheat. We had no other means at that time of getting our wheat to the market except by wagons to Wichita. The aim of using these boats was for freighting down the river. There was a little boat here run for awhile called the "Necedah." There was a boat here called the "None-Such" which came up the river and went back down the river. The "Kansas Millers" was built by the people of this town about 1884, I think. It was built for trading down the river, the same as the rest. The power used on the "Kansas Millers" was steam.

920 There were some barges built here for freighting wheat down the river. I think some wheat was freighted down the river in them. There were flat boats previous to that loaded with wheat and went down the river that were built here. I couldn't say how many, but there were two or three or perhaps four. I heard of a boat coming down the river but didn't see it. (Objection.) I recollect the Government snag boat. That started from Little Rock and came up as far as the Pawnee agency, or as near the Pawnee agency as it could get. I was down there and stayed with Capt-in Evans a few days and he told me about the appropriations.

921 (Objection.) After they built the railroads here we didn't have so much occasion to use boats. My recollection is that the railroads were built here about 1879. I think the river was navigable for shallow boats for perhaps six or eight months of the year. Boats built for the purposes I have referred to came
922 up the river. The canal was built from 1880 somewhere to 1883. I don't see that the Walnut has decreased to any appreciable extent during these last few years. It rises, I think, in Chase county, and I suppose originates in springs. It doesn't come from the mountains; it is a local stream.

Cross-examination.

By Mr. HAYT:

By the use of the term "navigable" I mean by shallow boats—that they could run up here a portion of the year. Steamboats I have reference to—small steamboats. I never knew of any of these boats coming back here after they had once gone down the river.

It was navigable one way only, that was all. They might
923 perhaps have come back, but they didn't. I never saw the "General Wiles" that I have spoken of and in which I invested $200 and lost it. We were not able to get the boat up here. I don't know anything about the size of it or about the power except from hearsay. I don't know how far up the river it reached on its upward course except from reports. I saw the "Cherokee." It was 50 or 60 feet long, and I think 15 feet across. I don't know

how much water she drew. The "Aunt Sally" drew eleven
924 inches, when she was empty, and two feet when loaded. I never saw her loaded except on the Walnut river. It was run as a sort of a novelty. It was a new thing to us. I don't know that they ran it every day but I would think she was here for ten days at least, on the Walnut river. The "Necedah" that I have spoken of was a small boat, a pleasure boat. It could not have been

over 20 feet long and 6 feet wide, perhaps, and would draw
925 about six inches of water. I saw it down the Arkansas below the Sixth Street bridge. This bridge is right south of the town, perhaps a little west. It was there several days and ran down to the mouth of the Walnut and back again. Afterwards it went up, I think to Oxford. That is about fourteen or fifteen miles above here. I know it went up the river, but I don't know how far. I don't know anything about the "None Such." She came here, but I didn't see her. The "Kansas Millers" must have been 60

feet long and 20 wide, with a flat bottom and steam power.
926 It was built in St. Louis. It drew about 18 or 20 inches of of water, I should think. I don't know what became of it after it went down the river. The barges that I spoke about took grain down the river. I saw the man who took them down; he told me, and I know he was a truthful man. I know they were loaded, by hearsay. I never saw them. I think there were two or three of them, but I didn't see them. When I spoke of the flat boats

I meant these barges. I intended to say that the barges and
927 flat boats were the same. I think there were four all together.

The "Wichita" was a Government boat—a snag boat. I saw it on the river near the Pawnee agency, about 65 miles below Arkansas City. It was built for the purpose of pulling snags, and it was a regular steamboat build. So far as I know it never got any farther up than the point at which I saw it. After 1879 or 1880 there were no further efforts to bring boats up here because the railroads had built in here and there was no further use for them. There was no necessity after that for that sort of navigation unless

it could have been done cheaper. When I said the river was navigable for six or eight months of the year I meant in the early
928 spring and perhaps in the fall of the year. In August and September we probably had as low water as we generally average. From that time to the first of March it was not very high; it was low. Sandbars would appear in the river. During the earlier years in the winter months I think there was more water than there is at present, considerably, but not so much as during
929 the summer months. I think the water has fallen off during the winter months about one half. These boats and these trips that I have described constituted all that was done with reference to navigation so far as my recollection goes. There might have been more, but that is all I have a recollection of.

930 There are four wagon bridges and two railroad bridges across the river at this point. These bridges are built simply high enough to accommodate the highest water; they don't always do it. I recollect a year about 1874, I think that is what we call the grasshopper year, the river was very low then. I presume I saw the river in 1874 or 1875 when it was very low and nearly dry. In those early days there were times when there was very little water running in the river, particularly that year.

931 The Arkansas river is a river of shifting sands, and the channels change from season to season. Sandbars are formed and shift the channel from one side to the other. Sometimes in places the sand is light so that the horses' hoofs would sink quite deep in them, and sometimes it is hard, and these things in part made the river treacherous.

This well that I have spoken of filled up not very far from
932 1880. It was located about 350 feet from this building. This block is on the corner of Fifth avenue and Summit street, and the well was about 350 feet east of here. It was fully a mile from the Arkansas river and ⅛ of a mile from the Walnut river. It was on the side of the ridge sloping towards the Walnut and the ridge is between the Walnut and the Arkansas river. It was just as you start off the slope toward the Walnut. I wouldn't be
933 certain that I gave Mr. Fitzpatrick the exact location. I told him where the original well was. Of course that well at that time was in the street and they wouldn't let him bore there again, so he bored as near as he could to it, over on the lot. There was the width of the sidewalk between them. I shouldn't think it could have been to exceed ten feet from the original well. I don't know from my own knowledge how deep Mr. Fitzpatrick went.

934 I never measured the amount of water in the river in the '70s not even by setting a stake at the river. I didn't notice
935 it particularly at that time, and it is pretty difficult for me to describe the amount of water in the river during those early years accurately. I can't give the amount with reference to any particular year. I might recall an unusual year, such as a flood year or an unusually dry year, but at its normal stage of water I don't

know anything about it. Yes, we had floods in the '70s and also dry years. I wouldn't place the average width of the bottom lands along the river in this county as high as Mr. Denton did. I should say if it averaged a mile, that would be my judgment upon
936 it. Where I live there is quite an abrupt rise to the south. The drainage extends perhaps a mile west of me to the river. The drainage to the south goes into what we call the Chilocco creek, and from that into the river. This high land in this vicinity was not plowed when I first located here. It has been brought under cultivation since that time almost entirely—in fact entirely. Crops have been grown and trees have been grown. When I came here there was plenty of timber on the Walnut river, and some considerable timber on the Arkansas river and some timber on the uplands above here, but very little below. We had some upland tim-
937 ber here, but above here I don't think there was any timber on the upland. The upland timber was nearly all black timber, a low, scrubby timber.

The first alfalfa I recollect seeing here was not more than three or four years ago. Most everyone who owns a place has a small patch of alfalfa now. The acreage has increased, not rapidly, but it is increasing. It is considered a profitable crop here.

938 I am in the real estate and insurance business. Farming lands have advanced from $20 to $40 an acre the last twenty years, since 1884, and are now $40 or $50 an acre perhaps in particular locations. I should judge there has been an increase in the last ten years. The bottom lands have increased in value during these years. I judge they have increased as much as the uplands. There was never a time to my knowledge when the bottom lands were of greater value than at the present time. During the
939 boom period I couldn't tell what land was worth. People went wild on farm lands.

Cross-examination.

By Mr. CAMPBELL

From my own knowledge I would not say that the Arkansas river is now used for navigable purposes from its mouth or where it enters the Mississippi. I know very little about navigation. When
940 I was a boy I used to row a boat around. At certain times of the year now there are times when the river contains water sufficient to float the barges and boats from here to Little Rock, that I spoke of. I think they would perhaps go down for a month or six weeks during the year, below the Walnut.

Redirect examination.

By Mr. ASHBAUGH:

941 I think freight could be freighted down the river cheaper than it could be hauled by the railroad, but I don't know that

942 of my own knowledge. Perhaps the rise of land values in this county has been no more than throughout all the West. The high price of land in the East has induced a great many to come out where they can get cheaper land. Land is sold for $100 to $150 an acre in the East and they can come out here and
943 buy for $50 and they think it is a pretty good thing. The rise of land values has certainly not been because of the diminution of the water in the river. (Objection.) I think land has been less productive because of the diminution of the river. I don't think that it has raised the price of land, and probably not
944 lowered it. The rise of land values has been due to other causes rather than the diminution of water in the river.

945 R. J. STEVENSON, Arkansas City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live on the Arkansas river two miles east and one mile south of Arkansas City. I have 100 acres of land, and have lived there continuously since 1870. It is one half mile above where the Walnut flows into the Arkansas. My bottom land on an average
946 is about eight feet above the normal flow of the river. I see the river every day. The flow of the river at my place on the average through the months from July to October, inclusive, is between three and four feet less than it was in the '70's when I first moved there. On the average for the last two or three years where I crossed it, it has been about 15 inches to two feet deep, excluding the flood of this year. It used to be in the '70's and '80's from three to four feet deep. During the last two or three years the
947 flow has not been more than one-half of what it was in 1870. The river is narrower than it used to be. The only place I ever measured it, it was 900 feet wide, in the '70's. It is not that wide now; it is about one third less. During the '70's we crossed the river by ferry if we couldn't ford it. In those early years we could ford the river about three months in the year.

Q. How much of the year can you ford it now?

A. Oh, we haven't forded it for about eleven months here for the last three or four years.

This year the water has been higher than it ever was. We
948 began to notice the decrease in the flow along in the '90's. It has been getting less since that time. I dug plenty of wells in the '70's, some of them on the first bottom and some on the second bottom. On the first bottom we struck water at about eight feet deep, and on the second at about 12 or 15 feet. On the first bottom where we dug, the soil was generally moist all the way down,
949 and it was moist on the second bench, and the moisture lasted clear down. Three years ago, in 1901, I dug a cistern twelve feet deep, but didn't strike any water. The soil was dry that year.

We strike water at about 15 feet on this second bench. I always thought the sub-irrigation on the bottom was a benefit to the corn. It always helped the corn. We could cultivate and the moisture would come up. We could raise corn with a small amount of rainfall. The corn crop on the bottom lands in those days was a heap better than the corn farther back on other lands. I don't think that the bottom
950 lands in recent years yield as well as in the early days. The decrease in the corn crop on the bottom land I think is due to the underflow water; that is one cause of it. I think it is due to the dropping of the underflow water. The underflow in my bottom land was fed by the Arkansas river, in my judgment. I noticed the decrease in the corn crop about the same time as the decrease in the river—along in the '90's. We began to notice the decrease in our corn crop about the same time the river was going down. (Objection.)

Cross-examination.

By Mr. DAWSON:

951 I should judge there is about 15 acres of my land within eight feet above the bottom of the river. It is in a swale. The balance of the land is all higher, about three feet higher, I guess. The bed of the river in the immediate vicinity of my land is made up of sand. At times there are holes and shallow places
952 in it. When I say eight feet I mean eight feet above the highest part, the level of the river. The holes are generally in the center of the stream. The river used to run on the average about two or three feet deep and of late years it only runs about 15 inches. Sometimes the river shifts its channel, but not very often. The balance of my land is about 15 feet above the level of the surface of the water of the river, on an average. I raised the best
954 corn on the 15 acres I have spoken of. I never ran any levels to find out whether the level of the water in the well was the same as the level of the water in the river. I think it was
955 along in August that I dug the well. Afterwards I dug four wells in the high lands. They vary according to the stage of the river. The average we struck water was from 15 to 16 feet, according to the river. I use a drive pump now. Since I dug
956 those four wells in which I struck water from 15 to 16 feet I have never dug any holes on the high ground deeper than 12 feet, and I don't know positively whether or not you can strike water at 15 or 16 feet there if you dig down.
957 I have heard the term "underflow" ever since I have been here, since 1870.
958 The river has been decreasing until this spring. There has been about the average flow of water this summer that there used to be in the '70's. There was a little while there was more than the average flow, about 15 inches more than there was in

1877. There are a couple of little creeks or streams coming
959 down from the high country above. There are a couple of branches. One branch overflows my place when it is high. It floods all over.

After I settled I grew corn on my place nine years without change, then I put in wheat and changed it back and forth with corn. I never fertilized the land. I have raised as high as 75 bushels
960 of corn to the acre, and as low as 30 bushels. In the '70's we had the rains pretty well distributed. We didn't have rains like we have now. It didn't take as much rain then to raise a crop in the bottom as it does now. I think it was about seven years ago that I raised 30 bushels to the acre, and we have had one worse year since—1901. 1902 and 1903 we raised pretty fair crops, not quite as good as in the early '80's. I never kept any account
961 of the production per acre of my land.

I think it must be six years anyway since I first noticed the discussion about taking the water out of the river. We have been talking it all along since the river commenced to decrease.
962 The river was dry in 1901. There was one time in the fall, I think it was in August, when there was no water passing. There is a cut-off down at my place here. What little water was running in the Arkansas river ran down this cut-off
964 into the Walnut. It was about four feet wide there—the water was. I could have crossed it with my shoes on and never get my feet wet. I think where I had to go 15 to 16 feet to water in the '70's the underflow was of value to the land for corn and for anything else. It would be better at 16 feet than it would be at 32. I have never measured to see just how deep corn roots go; it is according to the season. If the top of the ground is
966 wet it don't root as deep as if the top of the ground is dry. She hunts moisture. I have never dug down to see how deep they do run.

Redirect examination.

By Mr. SMITH:

Generally when the water was the highest was when I had better corn crops. When the water was low the corn crop wouldn't be quite so good. According to the local rains. Now, you take where the local rains come right you can raise a corn crop without the underflow of the water, but if we didn't have much rain, if we had high water in the river we would have pretty good corn.
967 (Objection.) I think the water in the well varies from two to three feet according to the condition of the river. The water in the well does rise and fall with the rise and fall of the river. (Objection.) The water in the river affects the wells farther back from the river by rising and falling. When the river was up high it would rise and when the river goes down it would fall.

968 Recross-examination.

By Mr. DAWSON:

Those are open wells, but they are filled up now and you can't investigate them to find out about the water without digging the hole out again.

969 W. H. SPEERS, Arkansas City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Arkansas City, and have lived in this vicinity since 1870. I am 67 years old. I am a stationary and steamboat engineer by trade. I have run mills and ferry boats, and had a little something to do with little steamboats. We have a small piece of
971 bottom land on the north side of the Arkansas river. We have about 110 acres there. This is first bottom land, and we have owned it since 1872. All the bottom lands were taken around here in 1870 and the winter of 1871, and
972 were proved up two years later. (Objection.) I used to be along the Arkansas river pretty often when I had a saw mill there, from 1870 to 1874. I ran that saw mill from the summer of 1872 to August, 1874. The timber was hauled from over here 12 or 15 miles. We sold the lumber to anybody that wanted it, and it was used in this country.

The average flow of the river during the first ten or fifteen years that I knew it, during the dry season of the year, excluding
973 the months when there was high water, was about 30 inches deep and about 400 feet wide. The banks are from 500 to 800 feet wide. Sometimes during those first ten years the river would flow pretty nearly bank-full, and sometimes two-thirds, and sometimes it was down so it was not more than 20 inches of water. The average flow of the river for the last ten years during the dry season of the year, excluding the months when there was high water, I should judge would be from 12 to 15 inches. During any of the first years I never saw the river dry. During the last
974 ten or eleven years I have never seen the river but what it ran some—7 or 8 or 9 inches of water in there.

During the first years we raised mostly corn and some potatoes on this land. In regard to the diminution of the water affect-
975 ing the productiveness of our land, it is this way: We used to get from 50 to 75 bushels of corn to the acre, and in the last ten years we haven't gotten more than about 30 bushels, until last year. Last year we raised a good crop of corn, and this year we raised a good crop of corn. (Objection.)

The ferry boat was built in 1870 first on the Walnut river; then

we took it over and put it on the Arkansas. Before that time
976 in crossing the river we tried to ford it. Sometimes they had to swim. During the early '70's I think the river had been fordable only a few days at a time, and then along in low water. I operated the ferry there until they built the Sixth Street bridge in the fall of 1872 or 1873; then the ferry boat got away from me and went down the Arkansas river. After the flood of 1877 when the bridge was washed out Amos Walton and myself built a ferry boat and ran it, west of town. They couldn't ford the river, for there was generally too much water. We ran that ferry boat until
977 about 1879 when the Sixth Street bridge was put in. During those ten years I don't believe the river was fordable any one month all the time, but it was fordable once in a while, you know, in the fall of the year.

We had a dispute here one day. They said no steamboat could stem the current of the Arkansas river. I told them I knew better and that it could, and Amos Walton and I took this boat of ours and put a threshing machine engine on it, and a water wheel, to run up and down the river. I think that we ran it about four
978 months. We went up as high as Oxford, about fifty miles above, and as low as the Kaw agency, about 35 miles below here.

I remember seeing the "Aunt Sally." It came up after a
979 load of wheat. I recognize Complainant's Exhibit A–6 (introduced in evidence) as a photograph of the "Aunt Sally." (Objection.) The "Cherokee" was built here by John Mc-
980 Laskey about 1879 or 1880. It was a steamboat with a stern wheel. They took a load of wheat and started for Fort Smith, Arkansas. John McLaskey and Amos Walton and Perry Woodin went on that boat. Woodin was the pilot. There was a little boat here called the "None Such." It came from Dardanelle, Arkansas. It took on a load of wheat and went down the river. I saw
981 the load of wheat on board. The "Kansas Millers," was built in St. Louis. The milling companies here brought it up to run flour and mill-stuff down the river. It was a steamboat with a stern wheel. This was about 1882 or 1883, not later than 1884. William Burkey and Winton built a barge and started
982 down the river with a load of flour. It was about 70 feet long and 16 feet wide. A lot of fellows built some barges to take potatoes down through the Territory, but I didn't see those. Henry Pruden and Palmer loaded a boat here with wheat and started for Fort Smith. We put some money into the "General Wilder," but I was told that their engine was not powerful
983 enough, and the boat didn't get up here. (Objection.) I have heard of boats coming down the river, but didn't see them. We always thought that in the '70's a light-draught boat could run, by fixing the river, probably six months in the year. (Objection.) On general information I am informed that the
984 river is navigable up to or near the mouth of the Cimarron, up above Fort Gibson. The "Aunt Sally" came up to get ..

load of wheat, but it didn't take a load. (Objection.) The railroads came in here in the fall of 1879 or 1880, and after that they never tried to ship any more down the river.

I noticed the diminution in the river somewhere along about 1887 or 1890—that there was not as much water in the
985 river as there used to be. I saw and talked with the Government engineer, who came down on a boat from Wichita. (Objection.) They called it the "McClelland" or some such name. He laid in supplies here to go through the Territory. He was measuring the water from Wichita down. All I know about him making any report as to the navigability of the river is what he said to me.

He said that by a lot of work on the river he thought a boat
986 could be run up here as much as six months in the year. I don't know how many there were in his party; I saw only three. They had a good size skiff—barge or skiff. I don't know where it was built, but it was built above here, I suppose. It hadn't gone up the river that I know of.

Cross-examination.

By Mr. HAYT:

There was a boat here that had a threshing machine engine on it. It was a boat that I put the engine on. It was called the "Sorghum Pan." I have been here all these years from 1870 up to the present time and I have described all the attempts to navigate this
987 river that I know of. Of these boats I think the "Kansas Millers" went down after the Santa Fe railroad was built. She went out with her barges. She had two barges. I think it was in 1883 she went out. It may have been 1884.

The Government appropriations for this river was a matter
988 of general discussion here at the time. It was along about the time they were trying to run these boats—about 1878 or 1879. When the appropriations gave out they didn't try to run the boats much after that. I don't know whether anybody got any money from the outside. I never saw the "Aunt Sally" on the Arkansas river. I suppose she had to come up the Arkansas river to the mouth of the Walnut. She never reached a point opposite to Arkansas City to my knowledge. As I have said, I had some discussion with reference to whether or not a boat could be
989 run up against a tide in the river. That was in 1878 or 1879, I think. They gave us some money around here and I fitted up that boat. It was a sort of public enterprise to show that a boat could run up the river. We didn't carry any freight or anything of that kind, only passengers. She was 50 feet long and 16 feet wide. I don't know as it was an enterprise we would have gone into unless we had some help from the outside. We didn't keep it up as a business proposition.

I saw the river in 1874. My remembrance is that there was

plenty of water in it until about August. That is about my
990 recollection. I have a pretty distinct recollection because we had a nice patch of corn that was growing, and it was the driest time we ever had and we were figuring on 40 bushels to the acre, but the grasshoppers came and ate it all up.

When I said the river was navigable for small boats I meant boats drawing not over 30 inches of water. I don't think the river was navigable for such boats at the common stages of the water. They could run at the common stage in the '70's. The "Kansas Millers" was down two or three times and came back. I
991 don't know of any of the rest of them coming back. I think the "Kansas Millers" drew 30 inches of waters when she went down. I think she would draw about 12 inches light.

Cross-examination.

By Mr. CAMPBELL:

On direct examination I stated that prior to 1880 the average depth of the water in the river here was about two and a half feet. There was more than thirty inches of water in the river when the "Kansas Millers" went down, which boat drew 30 inches. There was more than 30 inches of water then.

994 Redirect examination.

By Mr. ASHBAUGH:

The "Kansas Millers" made several trips down the river and came back. I went on one trip down with them on the "Kansas
995 Millers" as engineer. Mr. C. H. Searing was along, who lives here now, and Pete Yont was fireman. There were several persons on board but whether they were passengers or not I don't know.

Cross-examination.

By Mr. HAYT:

996 There were five or six or seven of them. I came back with the boat as engineer. In going down we tied up at night—we couldn't run nights on account of the sandbars—low water. Coming back we tied up at nights also. It would take us two days to go down, and one day to come back light. The trip I made was down near Pawnee City, in the neighborhood of 80 miles by the river. It took us a day and a half to come back. The boats were all stern wheelers.

997 E. J. HOYT, Arkansas City, Kansas.

Direct examination.

By Mr. SMITH:

I have lived in Arkansas City since 1870. I have been quite familiar with the Arkansas river since 1870. I had a ranch up here and was connected more or less with the river, because I was hunting and trapping on this river at that time. I was acquainted with the river from 15 miles above Leadville, Colorado, to Fort Gibson, and I hunted and trapped all the way up and down the river more or less, and camped on the river, and crossed the
998 river frequently from 1870 to 1889. It was a pretty good size river along after the '70's. It is a hard thing for me to say what the average depth would be. I crossed it a great many times and had to swim it a great deal of the time. I had to swim my horses. We always hunted for the rock crossings to ford. We usually had to swim before we got across, at all times of the year. I suppose there have been some times in the year when we would not really have to swim, but it would depend upon the size
999 of the horse about that. If you had a young pony you would come pretty near swimming; but if you had a long-legged horse he might go through and wade along in the lowest water. The river here as I knew it from 1890 is about one-quarter of the amount of water of the average flow of the '70's from July to
1000 October. I commenced to notice the decrease along about 1890. I have been up the river since 1890, but was on this side all the way up.

Cross-examination.

By Mr. DAWSON:

I was at the sources of the Arkansas river in 1880. I was prospecting then more than anything else. I was all through the Leadville boom. I followed the river up to the head. I went overland all the way from here. I crossed the river now and then. I crossed it at Big Bend and struck it at Lyons and all along. I struck
1001 the river about Dodge City. The last 150 miles I passed along about the first of May. When I was at Leadville in 1880 it was in the spring. I left this town I think about the first of
1002 May or last of April. I made the whole trip in 30 days. I think I forded the river at Fort Dodge at that time. I forded it with a wagon. We had no difficulty. I believe we went across all right. I don't think it went into the wagon bed. On that trip I crossed the river at Arkansas City on the bridge. I think I could have found crossings here as good as I did up there if I had to ford

the river. May, June, and July were the times when in the
1003 early years we had plenty of water here.

Q. And those were the months when you were telling counsel on your examination in chief that it generally would swim your pony?

A. It generally did, yes, sir.

Q. And yet in May of that year you think you could have forded it here with a wagon?

A. I think I could have forded some place. I could have found some place where I probably could have forded it.

I don't know as the water had fallen much from 1870 to 1880. I didn't recognize much of a fall then. I didn't realize it until
1004 it got up towards the '90s somewhere. The water was going up and down all the time. Some months—really a few days would make a great deal of difference in the height of the water. It is up and down, up and down. The river is not as large at Dodge City as here at Arkansas City. I couldn't say whether in 1880 the amount of water flowing in the river at Dodge City was as much as was flowing at Arkansas City. I know that the river drains a large area of country between Dodge City and Arkansas City. I
1005 don't know how far it is from here to Dodge City. I should judge it was 100 miles. It is only 500 miles from Pueblo to Arkansas City. I don't know how far it is from here to Dodge City, and I wouldn't give an estimate. When I went up the river I found plenty of water in Colorado above Pueblo. There is most always water running there. It was very narrow up at Leadville;
1006 you could step across it. At Pueblo it is rocky, and of course runs quite swift. I forded it at Canyon City and had no trouble in fording it there.

Q. Why did you ford it there when there were two bridges you could cross?

A. There were no bridges there that I knew of.

I didn't see any bridge. I forded it and went over the Iron Mountain road. I went right up by the penitentiary and forded it by that little soda spring there and went right across and went over the Iron Mountain road. I don't remember seeing any
1007 bridge there. I think I went up by Canyon City in 1880. We left the river above Canyon City and came back to it at Salida. Above Salida we were part of the time on the river and part of the time off. We followed the road wherever it went. I think it followed the river most of the distance. I stayed up in that country three years. The country up at the head waters
1008 of the Arkansas river was pretty well timbered at that time, except Bald mountain. I have been over Tennessee pass; there was considerable timber scattered around. I have been over the Mosquito range. If I remember right, it lies east of Leadville. Above timber line I guess there is not much timber. In going over the Mosquito pass, if I remember right, you go pretty nearly above timber line.

Q. What is your business now?

1009 A. Nothing.

Since I came down from Leadville in 1883 or 1884 I have been a moving planet most of the time. I came right from Central America here; that was a couple of years ago. I have been here two years trying to get straightened out from some wounds I got in Central America. As to the time that I have been away from the Arkansas river between 1884 and two years ago, I will say I have been backward and forward here all the time. The longest I have been away at any one time has been about two years at a time, if I remember. Not longer than two years at a time. When I came back I wouldn't go and measure the river or look it over. I never measured it, only as I would walk through it. When I came back on these trips I would stay six months sometimes, sometimes three months, sometimes ten days and sometimes a year.

Q. And then light out again?

A. Yes, sir. I would stay as long as the grub lasted and then light out to get more.

1010 When I went out on these trips I was generally engaged in mining. I have worked on grub-stake in Nova Scotia. I can tell you easier where I hav-n't been than where I have been. I have discovered a good many mines. I am a musician and I work at that at odd times. I was with a wild west show a part of the time. I was back there two different times with Pawnee Bill one year, and then I had my own show back there at Borden's Crescent park on the Narragansett bay, seven miles from

1011 Providence, Rhode Island. When I was engaged in trapping in this country in the early days I was engaged in that principally in the winter time and trapped when I didn't have anything else to do, like I play a fiddle when I have nothing else to do. The trapping season is generally in the winter season. The fur is better then.

The river has been falling off from 1890, from December to March, both inclusive, as compared with what it used to be in the '70's. It has been getting less all the time. I don't think there is much over one quarter or one third as much water now as there was in 1870. That is the way I size it up. From 1890 to 1898 there wouldn't be more than one third as much water flowing in the river from the first of December to the first of April as there was flowing dur-

1012 ing those same months from 1870 to 1878, taking the average. About one-third as much from 1900 up to the present date for these months I have mentioned. I should judge so. I feel sure that that would be a reasonably close approximation. That would be my best judgment.

Cross-examination.

By Mr. CAMPBELL:

When I said that the Arkansas river had only about one third as much water now as it had prior to 1880 I meant above where
1013 the Walnut flows into it. My observations with respect to the flow of the water in the Arkansas river have been oppo-
1014 site this town where we now are. I haven't been at the head waters of the Arkansas river since 1883. I went up there
1015 first in 1879 and I was backward and forward for about three years. I noticed when I went there in 1883 that the timber had been cut off in some places since my first visit there.

Redirect examination.

By Mr. SMITH:

I have occasionally noticed the river at other times and other points along here, and my statement applies to the river wherever I have seen it, both above and below Arkansas City.

1016 ELIAS NEFF, Arkansas City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Arkansas City about 20 years. I came to Kansas in 1883 and lived in Winfield about six months and then came to Arkansas City. The canal or race was dug to Arkansas City when I came here. The canal was dug when I came, but I couldn't say that it was completed. There might have been some work done on it after I came here in February 1884. (Objection.) That
1017 was one reason why I came here; I thought that canal would be of some advantage to the town.

No cross-examination.

1018 JOHN MYRTLE (recalled), Arkansas City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I came to Arkansas City in 1871, and I know that the canal was built previous to 1884, because I attempted to sell some wheat to Mr. Ayers, who was then running a mill down there on the canal in 1884. That was the old Ayres mill. They were using the
1019 canal then for water power The mill had been built before that time, and perhaps as early as 1883.

Cross-examination by Mr. DAWSON:

The mill was the only institution that I remember of that was running by water power at that time.

ARTHUR H. GREEN, Arkansas City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live ten miles from Arkansas City, on the Walnut. I am a farmer and have a farm in the county here. The farm is on both sides of the Walnut river. I have lived there since November,
1882. Excluding the present year, I don't think that there
1021 has been any material change in the flow of the Walnut river in the last twenty years. The Walnut river rises in Butler county mainly and is fed by rains and springs. The year 1904 has been an excessively wet year; the Walnut river has been very high.

FRANK J. HESS, Arkansas City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived at Arkansas City since the spring of 1877 I am 46 years old, and a real estate agent, and I am familiar with the city and its institutions here. (Objection.) The canal or race through
this city was constructed in the year 1881. Mr. V. M. Ayres
1025 and James Hill each built a mill on the canal right after it was completed. These were flouring mills. They used water power from the canal. The canal was built for water power purposes. The canal empties into the Arkansas river. The canal is about four and a half miles long. The water passes through the canal and is finally returned into the Arkansas river. At first the following institutions using water power were built on this canal: Willliam Speer built a stone mill; V. M. Ayres built a frame mill;
Landis, Hill & Beal built a very large stone mill. These
1026 were all flouring mills. A little later the Plummer Chair Company built a large three-story stone mill, built to use water power, to manufacture chairs. The Kirkwood Manufacturing Company built a two-story stone building to manufacture windmills by water power. The electric light plant built a frame and stone structure to generate electricity by water power. H. T. Roberts built a frame building to run a saw-mill—that is, a planing mill—by water power. There was also built several large elevators in conjunction with the mills, for elevating grain. The capacity of one was 150,000 bushels, using water power from this canal. (Objection.)

I have been acquainted with the flow of the Arkansas river ever since 1877, in a general way. Between the flow of the river
1027 during the first ten years that I knew it and during the last ten years, during the dry season, excluding the months when there was high water, there is quite a difference. There is a good deal less water, and the Arkansas now is an insignificant stream. In the early days here we did everything we could to have Congress appropriate some money to clean out the river. We had aspirations to have navigation at Arkansas City. We petitioned Congress and we built a steamboat called the "Kansas Millers" to haul lumber up from Arkansas and flour down, and there was some money appropriated and expended on the Arkansas river in dredging and removing snags. Mr. Wood was one of the officers or ap-
1028 pointees who had charge of this work. Mr. Wood was from Wichita and represented the United States Government. That work was done in the '80s, but I couldn't fix the year definitely. The "Aunt Sally" came up here from Fort Smith with some lumber, I think, and loaded with flour, and was anchored here in the Walnut. They didn't have any trouble with her taking a load of flour down the river. I was on the boat myself. I think they made a trip up and down the river there before they loaded.
1029 The railroads were built in here in 1878 or 1879.

Cross-examination.

By Mr. HAYT:

I don't recollect that the railroad had any influence upon navigation here. We stopped our efforts in that line because the river ceased to be a river. For one reason, we lost money on the "Kansas millers," and I don't know whether it was because it was not practicable or why. That was in the 80s. We never made any money on any of these steamboats.
1030 I don't mean that I was on the "Aunt Sally" when she went down the river but just while she was anchored here on the Walnut. The "Aunt Sally" didn't go above the mouth of the Walnut that I know of.

The chair factory ran about two years during 1881 or 1882, somewhere around there, and then it busted. The wind-mill factory is still running, and the planing mill factory is just about being removed now. They are moving it up into the town. It was
1031 operated here, I should judge, from 1885 or 1886 down to within the last month.

Cross-examination.

By Mr. CAMPBELL:

There is about one third as much water in the Walnut as there was in the Arkansas river in the early '80s in my judgment. The

Arkansas river at the present time has about one quarter as
1032 much as the Walnut where the Walnut flows into the Arkansas. The "Kansas Millers" came up to the mills above the Walnut.

Redirect examination.

By Mr. ASHBAUGH:

These mills that were originally located as water power mills have now an auxiliary steam power that they use on account of the insufficiency of the water in the canal.

Recross-examination.

By Mr. HAYT:

When I say that the Arkansas river of late years has about one quarter as much water as the Walnut I am speaking of the
1033 Arkansas river below where this mill race takes the water out of the river and carries it into the Walnut. I don't think much water of the Arkansas river flows over the dam in dry weather. Of course that is governed largely by the seasons. When there is no water running it doesn't flow over the dam at all
1034 in the summer time. It is dry a good portion of the time. During the last two years the canal has taken all of the water out of the river at that point all summer, I should say, with the exception of freshets in the spring. We usually have high water here in June, I think. It varies from 30 to 40 days. The canal takes practically all the water during the months of July and August. That is not true this year, because we have had two freshets this year—one in June and one in July.

According to my recollection the canal took the water all out of the river during the months of July and August, 1903. This photograph (Defendant Colorado's Exhibit 1, taken July 18, 1903)
1035 in this book of photographs of the Arkansas river taken from the left bank down stream, shows one of our bridges across the Arkansas river, I should judge. I couldn't tell which one.
1036 (Objection.) I think the river was practically dry during the season of July and August, 1903, with the exception of any rains that might have raised it temporarily or momentarily. My recollection of the flood of last year is that it was in June. It might have been in July, but I know that is away above normal in the summer time, and that flood was caused by a rain or freshet.
1037 (Objection.) I should say that that picture shows the water above the normal in the summer condition—above the average flow in the summer time. (Objection.) It is not at the high water stage. I have seen it up within a foot of the floor, if that is the Chestnut Avenue bridge. This picture (Defendant Colorado's

Exhibit 2) looks something like the dam. (Objection.) The
1038 picture shows that it is high water. If that picture is true and if it was taken on the tenth day of August, 1903, I should say that at that time the water was high in the Arkansas river at that point. (Objection.)

1039 W. M. SLEETH (recalled), Arkansas City, Kansas.

Direct examination.

By Mr. SMITH:

The Arkansas City Power Company was formed in Arkansas City for the purpose of developing the water company and con-
1040 structing the canal. I have the original charter in my hands now; it is dated December 17, 1880. (Objection.) Soon after that a canal company was organized and proceeded to work early in the spring of 1881. The canal was actually dug and completed in the spring of 1881, and an extension was made farther up the river in 1887. The first buildings for manufacturing purposes were erected on the canal I think some time in the year 1881. The canal was used at that time and has been used continuously ever since for conveying water for power, so far as I know.

1041 Cross-examination.

By Mr. DAWSON:

We have leased to the Arkansas Milling Company 300 horse-power, and then we have the electric light company, about 150 horse-power. I couldn't say what is the limit of the canal's horse-
power production. It has 22 feet fall or drop as the maxi-
1042 mum. It wastes over after that. The wind-mill company is using horse-power now. Those are all the companies that are taking power from the canal now. We have found by experience that that is ordinarily all the power that the ditch or canal will develop. I don't know that any of the other institutions along the canal have stopped using water power from it except the chair factory; it has stopped using water power, but not for the reason that they could not furnish it. The grade of this canal is 18 inches
1043 to the mile—a foot and a half to the mile.

(Complainant's Exhibit A–6½ introduced in evidence. Objection.)

1045 I. H. BONSALL (recalled), Arkansas City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have now a copy of the original picture that I made of the "Aunt Sally" on the Fourth day of July, 1878, as she stood in the Walnut river. I made the original picture. (Complainant's Ex-

hibit A–6, introduced in evidence.) The copy of this original photograph that I now have and that has been offered in evidence
1046 is an extra fine copy. It is an enlargement of the original. It is made a little larger but not quite twice as large. (Objection.)

1047 P. H. FRANEY (recalled), Arkansas City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I commenced the canal at Arkansas City on the 28th day of February, 1881, and completed it just a year from that date. The width on the bottom, when completed, between the banks, was 15 feet, and it had a slope of a foot and a half to a foot rise. The width of the canal at the top when the canal is full of water is about 39
1048 feet. I measured it this morning. (Objection.) The depth of the canal when it is flowing full of water is four feet and nine inches at one point, as measured this morning, and four feet six sinches at another. I recognize Complainant's Exhibit A–7 (introduced in evidence) as a picture of the tail gates before completion at the foot or outlet of the canal. This picture was taken in 1881, and is a correct representation of the canal as it then looked.
1049 (Objection.) I recognize Complainant's Exhibit A–8 (introduced in evidence) as a picture of our men working on the tail race after the canal was built, in this same year. (Objection.) The building shown in the picture is the first building constructed on the canal, and is a correct representation as it then appeared.

No cross-examination.

1050 A. A. NEWMAN, Arkansas City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Arkansas City continuously about 33 years. Am 61 years old, and in the dry-goods business. I have been connected with the milling business ever since I have been here, and have been interested in other enterprises. I was a charter member of the canal company and a director in the company ever since it was organized in 1880. We commenced to dig the canal in the spring of 1881, and it was completed that summer, so far as making it a water power. There had been additions or extensions since that
1051 time, which I think were made in 1885. Our engineer said that the canal would produce, when full, about 1000 horse power. (Objection and motion.) I have been connected with this company during all these years, and I know the capacity of the canal myself and of my own knowledge. (Objection.) We have

leased at one time about 500 horse power. The total cost of construction of that canal down to date has been about $150,000.
1052 The total expenditure to date of the Speer mill I think has been somewhere from fifteen to twenty thousand dollars. (Objection.) The total expenditure of the Ayers, the Landis, and the Arkansas City Milling Company's mills, the three having been consolidated, has been about $125,000. (Objection.) In the elevator additions and improvements the total expenditures to date have been at the minimum about $15,000. (Objection.)
1053 These improvements have been doubled, in the cost. (Objection.) The total expenditure of the electric light improvement has been about $20,000. (Objection.) I am a part owner and help to pay the bills. (Objection.) I am positive it would reach between twenty and twenty-five thousand dollars. The total
1054 expenditure to date in the wind-mill factory has been at least ten to fifteen thousand dollars. (Objection.) My experience is a mighty sore point in some of these matters. I was unfortunate enough to have it cost me individually $5,000. The total expenditure of the chair factory has been at least $20,000. The total expenditure of the milling company has been probably $2500. (Objection.) The total expenditure of the mattress factory has
1055 been something more than $20,000. (Objection.)

The city of Arkansas City now has between seven and eight thousand people. In 1880 the Government census gave us 1,060. The business portion of our city is now built principally of stone and brick—more stone than brick. (Objection.) Nearly all our blocks are two-story. There are some three-story buildings. (Objection.) There are ten three-story blocks in the city; there are three four-story blocks in the city; and the Fifth Avenue hotel is a five-story building. The material of all these three, four, and five story-buildings is stone. The Fifth Avenue hotel cost between one hundred and one hundred and twenty-five thousand dollars.

1056 Cross-examination.

By Mr. CAMPBELL:

The assessed valuation of the city ten years ago was about $1,500,000, and I think it is about one half that now. The assessed valuation is about one-third to one-fifth of the real valuation.

Cross-examination.

By Mr. DAWSON:

I have had some experience in figuring the horse-power produced by water. I was giving the amount of horse-power that this
1057 canal produced, both from my own figures and from those furnished by somebody else. As far as my experience went my figures were better than the engineer's on cost of horse power and on horse power. Mine were practical. I have been in the mill-

ing business ever since I have been a boy. The carrying capacity of this canal varies. It has about 24 feet drop as a maximum at the delivery. It was supposed to be 22 feet at the start, but the banks have been raised a great deal since the canal was built, so that it will carry more water than when it was constructed—from two to five feet more. When I say that the canal has 1,000 horse-power I mean it will produce that amount of power. I don't know the difference between gross and net horse-power. The power I refer to is net horse-power. The maximum power we ever delivered to anyone from this canal was about an even 500. We have had
1059 twice as much as that at one time that we could have delivered. We can still do so at the river's full stage, but there are portions of the year, probably half of the year, that we do not have the water. There have been times when we took all the water out of the river into our canal, but I think not until within
1060 the last nine or ten years. I couldn't tell the exact time. As far as the ditch is concerned, the ditch is as large as it has been, but we fail in water through the dry months and it has sometimes failed to the extent of more than one half of its horse-power capacity. This principally occurrs by shortage of water. But the flow has sometimes been reduced 75 per cent. at its maximum by the rising of the water in the Walnut river. The river sometimes freezes up so largely that there is very little water runs in the river. The principal time when we have an insufficiency of water
1061 is in the dry season in the summer. When the Walnut was not up so as to affect our canal and there was no ice in the canal, there has been a time when the canal would not produce one fourth of its capacity in horse-power because of the shortage of the water. That was the case in 1899, 1900, and 1902. In 1903 there was a better stage of water and there was more rainfall in this country adjacent. In the three months commencing with July, August, and September, in the years 1899, 1900, and 1902, we had a shortage of water for the canal. It was not always continuous. We had rains and the river would flush at times and there would be more water than at other times. I know that this canal will produce more than 450
1062 horse-power net for actual use. It was on account of the shortage of the water in the dry months that some of these enterprises on the canal put in steam power. It was also in order to overcome the lack of power because of the interference of high waters in the Walnut river with the power. There are times for a day or two days or three days at a time when the Walnut river is too high. The fact that the ice would freeze in the river and canal and interfere with the power had something to do with the installing of these auxiliary steam plants. All these causes operated together, but those causes were the minimum; they were only for a short time, from a few hours to a longer period, and the shortage in water ran through a series of months. I had something to do with the

building of all of these various plants constructed along this
1063 canal, except the original building of the Ayers mill. When I spoke of the cost as being down to date, I meant all the improvements. I didn't include the cost of taking out old machinery and putting in new, except the extra cost of the new over the replaced machinery. I included the cost of the auxiliary steam plants. There were no steam plants put in until we were unable to furnish the required amount of water on account of the dry weather and the low stage of the river. Our canal is running a full head at this time, the 24th day of August, 1904. The recent high water we have had in places has damaged the canal. There is plenty of water in the river today to run the canal full, and I think
1064 there has been plenty most of this season.

Quite a few of the large blocks in this town were built during the boom period when the town had more people than now. It was a pretty active boom and it broke I think in 1887 or 1888. The five-story Fifth Avenue hotel was occupied and run as a hotel for a while. I think it ran some time after the boom bursted,
1065 but I am not certain. At present it is let out to roomers. I have not been in the hotel for some time, and I don't know the state of the rotunda and office and of the plaster on the walls. Quite a few of the people that were here during the boom times went south to Oklahoma.

Redirect examination.

By Mr. ASHBAUGH:

The planing mill has been removed away from its original location on the canal on account of the uncertainty of the water power. (Objection.) As to the Walnut river interfering with the water power in the canal, the Walnut is a short stream and runs
1066 down rapidly, and might interfere sometimes a day and sometimes a week. There has been but very little interference from ice in the last few years.

Recross-examination.

By Mr. HAYT:

Approximately, I should say that the Walnut has interfered with the water power during this season of 1904 about 25 or 30
1067 days. This summer the Walnut had more high water than usual. It might have been less or more than that. I have seen the Walnut river during the high water of this year about every day I was here. I have not been here continually, but most of the time. I think the highest water in the Walnut in the year 1904 was somewhere in the neighborhood of 19 or 20 feet above the ow water. I don't know about the normal. The gauge starts at ow water. I should say that approximately the Walnut river at

the mouth of the canal was ten feet above low water mark for
1068 about ten days during the season of 1904. The flood of 1904 was the greatest, the highest, and the longest this country ever had.

1069 L. E. WOODIN (Recalled), Arkansas City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have been connected with the Arkansas City Power Company for eleven years I think. For the first two or three years I was assistant secretary and the balance of the time was secretary of the company. The canal when supplied with water to its capacity furnised 1,000 horse power. (Objection and motion.) The actual amount furnished to the parties using the same was 425
1070 horse-power exactly. That is covered by the leases of these various manufacturing plants. (Objection.)

Cross-examination.

By Mr. HAYT:

The paper I have in my hand is my report to the stockholders of the water power company made in 1895 and I am testifying from this report. I looked at that paper when counsel asked me a question, because I wanted to be positive. I am not using it in this examination, because I know the exact number. I looked at it
1071 just to refresh my memory. I can tell you the very amount that is furnished. I have a list here of the number of people or concerns to whom this 425 horse-power was delivered. 300 horse power was delivered to the Arkansas City Milling Company, 50 horse-power to the Arkansas City Gas and Electric Company, 25 horse power to the Kansas Mattress Company, 25 horse power to the wind engine company and 25 horse power to the Plummer
1072 Chair Company. I think that makes 425. The leases were made and in force before I had anything to do with the company in 1890. They were made prior to 1890. This 425 horse power was furnished in 1890, 1891, 1892, etc. I was there during those years. I don't know that there was any record of the amount of power furnished made except in my report, but the leases were on file in the office. In that way we know just the amount
1073 of horse power that is to be furnished. We furnished that horse power during the entire season whenever we had water to furnish it. Those establishments took that entire amount, and during low water we were compelled to deduct for the low water. I don't remember how much we deducted for the year 1890 in low water. The report which I used to refresh my memory was merely a record of the leases, and it is based upon the amount of water re-

quired under the leases. This particular report was made in
1074 1895. I made a report every year and just took one out of the pack. This report covers the year ending December 31,
1895. This particular report was made in January, 18[illegible]. (Objection.)

1075 FRANK J. HESS (Recalled), Arkansas City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

The removal of the planing mill from the original site upon the canal I referred to in my testimony yesterday was because of frequent interruptions by lack of water—shut-downs. (Objection.) I have always taken an active interest in the development of the city since
1877 and have been connected with the chamber of commerce
1076 and similar organizations. I have always claimed that the water power was the biggest thing we had here. (Objection.) I think it helped to make the city what it is, because of the possibility of introducing manufactories and of having a "bucket brigade" as we called it. There are not equal water facilities in other places in this vicinity. (Objection.) If manufacturing interests should be
built up in another city near here they would have to use
1077 steam power or other power than water. Water power I know is much cheaper. (Objection.) There has been additional cost in maintaining a manufactory in this city on the canal since the addition of steam power. (Objection.) Auxiliary steam power has been added to the Arkansas Milling Company's plant and to the electric light plant.

I am in the real estate business and farming, and dabbling in a little of everything, I guess.

The extra cost on account of the introduction of steam power in
these different enterprises that were originally run by water
1078 power has been because of the incidents connected therewith—
the buying of coal, the hiring of engineers, the switching from the water to the steam power and the reverse, and the extra insurance. We charge them an extra premium for the insurance when they use steam power. I am in the insurance business and insure them, and know of my own knowledge of these extra insurance rates.

1079 There was a rain on Saturday night, July 12, and one on July 14, 1903. (Objection.) I am using a memorandum I made this morning and last night to refresh my memory, the data being taken from the daily papers. (Objection.) I know that last year the rainy conditions were abnormal. We had more rain in the summer months than we had before. I think we have had much more this year than last year. I have a record of those years
of high water. (Examining Defendant Colorado's Exhibit
1080 1.) When that picture was taken the river was higher than ordinary at that time, but whether there was a flood condi-

tion I don't know. Examining the picture taken on August, 1903, (Defendant Colorado's Exhibit 2), I would say it was taken at high water. It was taken at water that had been higher a day or two before. There had been a flood a day or two before.
1081 The water was several feet higher. I examined the files of the daily papers and made the notes which I am now using from what I gleaned there. They were taken from the daily papers of 1903 and were made since last evening. (Objection.) On August 7, 1903, the river was up from two previous rains, and on August 8th we had another large general rain. On August 6th we had a general rain, and on July 31.

Cross-examination.

By Mr. HAYT:

1082 If I stated yesterday that the river was dry during most of the month of August, 1903, I was mistaken. I am satisfied now from the pictures and from the examination I have made that on the tenth day of August the river was well up, in 1903, and I don't know of my own knowledge further than what I have looked up here and testified to what days during the month of August the river was up and what days it was down. I stated yesterday that the rains occurred during the spring of the year last year, and
1083 I also stated that there was a flood in August or September upon the Walnut river, and I thought upon the Arkansas river, but didn't know. I should say that this canal didn't take all of the water out of the river during the months of July and August, 1903. It seems there was threatening weather and rainy seasons from the latter part of July to the 10th or 15th of August, running over a period of 20 to 30 days that rainy conditions prevailed throughout the State. 1903 was a wet year in this vicinity during the months of July and August. I have refreshed my
1084 memory since I was examined yesterday, from the "Daily Traveller," and have talked with a number of persons in reference to this case since leaving the witness stand yesterday. In those early days we relied upon this water power principally in building up the city. We boomed it and talked it, it was our religion. Now we have a better town that we are relying on making it better still. We expect to make it one of the best in this
1085 State. The rate of insurance upon such buildings as I have spoken of and where the power used is water power is $2.85 or $3.85 per $100. It varies. Whenever they use steam power a part of the season the rate is 25 to 50 cents per hundred extra per year. I don't know but what steam power has its advantages over water power. I know as a general proposition that water is much cheaper than steam power.

Cross-examination.

By Mr. CAMPBELL:

The chair factory company has been removed from the canal site. The building is there but it has not been in operation. The factory is still there, but not running. It failed, but the build-
1086 ing is there yet, and a part of the machinery. The chair factory didn't fail by reason of the uncertainty of water. The planing mill has removed up-town; they are using gasoline power.

Redirect examination.

By Mr. ASHBAUGH:

It is a matter of natural pride to us here to have the best city in the State and to make it one of the best. Our rival towns have pointed with pride to the fact that our water power is no longer a good water power, and I would say that in a general way it
1087 has hurt us. How much, I couldn't tell. (Objection.)

I live in the southeast part of the town about three quarters of a mile from the Walnut river. I was affected by the flood in the Walnut river in the spring of 1904 and lost about $5,000. I have the exact dates and hours, showing the high water in the Walnut river this year that interfered to any appreciable extent with the water power in this canal. It was about five days in June and probably six days in July that the flood water in the Walnut river interfered to any appreciable extent with the water power in the canal during the year 1904.

1088 Recross-examination.

By Mr. HAYT:

This memorandum was taken at the time of the flood. I have a farm, and am very much interested, and have to watch to get some stuff out. It is a memorandum running from day to day and is a farm diary.

Recross-examination.

By Mr. CAMPBELL:

We have as good freight rates on merchandise in and out as our rival towns; that is, immediate towns. If you call Wichita a rival, we have not. This is not a common point with Wichita in all things. For things that are manufactured along the canal. I don't think they get the same flour rate. It is my understanding that Wichita has a better freight rate on flour and grain than this town. That would surely have some effect upon the building up of the town and its business. I think we have as good freight rates on

those things that are manufactured along the canal as other
1089 towns, outside of Wichita. I think we have the same grain and flour rate as Winfield. I am not positive, however. I know that the freight rates upon merchandise in and out of town cut a very important figure as to the growth and property of the town. It is a fact that Arkansas City has had disadvantages in freight rates that have worked against our town.

Recross-examination.

By Mr. HAYT:

The Walnut river was above its normal flow eleven days in the month of June, 1904. In that time the river went up, and receded, and came up again. I should say that in that entire time it
1090 was five feet above the normal flow. A ten-foot rise is not a bad rise, but it would materially affect the water power. A five-foot rise would not affect the water power much; it would affect it some. During the month of July it was more than five feet above the normal for more than thirteen days. In July it would be ten feet above the normal about six days. For five days it was fifteen feet above the normal. At the flood time it was 20 feet 11 inches and three quarters above the normal.

1091 Redirect examination.

By Mr. ASHBAUGH:

The rise in the Walnut river from an ordinary rain would not affect the water power at all, and a simple and ordinary rise in the water would not affect it.

KINSLEY, KANSAS, August 25, 1904.

1093 R. E. EDWARDS, Kinsley, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I am 63 years old. I have lived in Kinsley, Kansas, 29 years. I came here in the summer of 1875. My business is banking and merchandizing. I have also run a lumber business a good deal of the time. I have done a good deal of business all over this
1094 county and somewhat further. I have a very good knowledge, I think, of the lands in this and adjoining counties. I own now somewhere near 10,000 acres. I couldn't tell how much I have owned during the last 25 years, but it has been somewhat extensive. It has been scattered all over this county, in different parts of it. I am acquainted with the Arkansas valley from State
1095 line to State line. Kinsley is about a mile and a half from the river, on the north side. The Arkansas valley here is

from three to ten miles wide. All this valley we call bottom lands. The first bottoms are along the river, and when we get back a varying distance from the river there is a rise of perhaps six inches to two feet. That is called second bottom. Then when we get
1096 farther back there is a gradual rise that we frequently call third bottom or upland. So there are three grades of land—first bottom, second bottom and upland. I think the valley through Edwards county will average perhaps six miles wide. The Arkansas river flows through Edwards county to the northeast up to about Great Bend; then it bends to the east and to the south
1097 again. About one half of the land I own in this county is bottom land. I have owned it probably on an average for 20 years. I have been farming it. The staple crops in this county are corn, alfalfa, wheat, oats and barley, and we raise an average amount of vegetables of the different kinds. When I came here I bought the town site, and have lived here ever since. The average flow of the Arkansas river excluding high water of floods, during the first fifteen years after I came here, would, I think, be over half bank full, and a thousand feet wide. (Objection.)
1098 The first bridge was built here in 1877, about a mile and a half east and south of Kinsley. That bridge, as I remember it, is 900 feet long. The depth of the flow of the river during those first years, excluding the flood periods, was about two feet. During the last ten years a great deal of the time the river has been practically dry. Tne banks have narrowed through this county very materially. I don't think the river would average over two-thirds to one half as wide as it used to be. During the early years
1099 there was such a thing as the June rise. The river during June used always to run bank full usually. It came from the west, the entire length of the river. We generally considered that the June rise came from the melting snows in the mountains. (Objection and motion.) During the last years the June rise has been very light. It runs but a short time when we have it. The narrowing of the river is visible at this point and almost all along its bank. On a farm I have adjoining town right here I think I have from 100 to 200 acres of timber now growing in what was the bed of the river when I came here, the timber being from one-half inch to nearly a foot in diameter. This fact is shown
1100 at the approaches to the bridge. The bridge is actually running through timber now, and the abutment that was made at the end of the bridge or near it is standing now as practically buried in soil that is at least three feet high. It is now largely buried in soil and back on lands that show the bed of the river when the bridge was built. The cause of the deposit of that soil I would suppose was the lack of current in the river, the debris in the river naturally drifting to the banks and adhering. This filling up of the banks of the river has not been artificial. I don't think a particle of it ever was. It is a natural filling. I don't know that I can

fix the time when I first particularly noticed the diminution
1101 in the flow of the river. I was a ranchman for a number of years. I had a herd of between two and three thousand. I attribute the diminution of this water to the taking out of the water in Colorado and farther west—diverting it from its sources. (Objection.) I have been in Colorado, and I think this diminution in the water was made apparent about the dates that ditches were being built. This, without examining anything, I should say was from 1883 to 1888. I don't think there has been very much change in the last fifteen years in the quantity of water—within ten to fifteen years at least. I had no idea I would be called as a witness until a few minutes ago when Mr. Smith called me.

We didn't do very much farming the first fifteen years. My
1102 first farming began about twenty years ago, and it was largely with alfalfa. I raised a little corn then. I presume I have planted an average of a hundred acres a year for the past twenty years. I have 400 acres in corn this year.

The first bottom lands I should say are about three feet above the surface of the river as it used to flow during the first fifteen years I was here. During those years I think we would strike water almost any time at a depth of four feet on the first bottom lands, and I have seen it where it was not more than 2½ feet deep, at least a man could reach down with his arm and dip the water out. We would dig such wells in the early days when we were cutting hay. You can dig down and get water at any point on this bottom land by going deep enough. I don't think there is any place on the first or second bottom lands where you could not get water within from 8 to 18 feet, according to the
1103 height of the bottom. I think all our water that supplies these first and second bottoms comes from the west. I would think it would be supplied from the same sources the river gets its supply from. (Objection.) The water under the first bottom land that I have spoken of rises and falls with the rise and fall of the water in the river. I think there is a visible and substantial current to this water that underlies these first bottoms, and that it flows in the same direction as the river. It flows northeasterly here. I think that is undoubtedly true. During those early years I think the crops grown and planted upon the bottom lands derived their supply of moisture more from the river than any other source. We had comparatively little rain then. I always had good alfalfa crops after I began putting them out. I have always felt that this alfalfa was supplied with moisture from the river. There are no
1104 marshy lands in Edwards county. I have probably had an average of a thousand acres in alfalfa for the last 15 years. The best alfalfa lands are about one half mile from the river, and from that to a mile and a half, according to the condition of the bottom. By the "condition of the bottom" I mean as to whether it is too close—whether the water is too close. In other words, whether the soil is too sandy. Where the soil is too sandy, where it is com-

posed almost entirely of river sand, I have never had as good success with alfalfa as where it is a little farther back, where there is less river sand and perhaps more alluvial deposit in the soil, and a little harder. The best alfalfa land, as judged from the depth of the underflow, is where the underflow would be 15 to 18 inches or two feet from the surface of the ground. I wouldn't want the water to rise high enough to kill the roots. If it rises to the surface it will actually kill the alfalfa when the sun shines. There is a happy medium. I have never paid any particular attention to getting it exact, but my judgment would be that the best alfalfa land is when the water was very seldom nearer than two feet of the surface of the top of the soil. I don't think that land would be as valuable and productive that is saturated on a level of four feet, for alfalfa,
1105 as land that is situated on a level of about two feet. I don't think that land where the water level would be on an average of six feet would be as good as where it is about two feet. My own opinion would be that alfalfa derives its benefits from the thousands of little tendrils that are within two feet of the surface, that shoot off from the roots; that it gets far more from these tendrils that are near the surface, and as the water is below them and the sun drying and heating, it certainly couldn't have the influence on it that it would if it was near the surface. This opinion is based upon my observation and my experience as an alfalfa raiser.

The underflow has materially decreased. The level of the underflow must be considerably lower—is lower. There is no ques-
1106 tion about that. The lowering of this underflow has diminished very largely the production of alfalfa upon these bottom lands. It has had the same deleterious effect upon the production of other crops upon these bottom lands; perhaps not to as great an extent, but it has had a bad effect. If the underflow should be decreased and should go lower, I think it would be still worse. (Objection.) We had a better crop always when the river was running nearly bank full than when there was no water—when there was comparatively little water. We had a better crop then, I suppose because the moisture permeated the entire surface of the ground. It is porous soil, and I suppose the water permeates through it. Whenever it is there I suppose it is circulating all through
1107 the soil. I know that to be a fact by experience. The soil is deeper when the river is full than when it is not. The soil in these bottom lands is rather light, porous soil, and the water from the river would make it moist.

My alfalfa crops during the last few years have been slowly growing less and less every year, and the cause of that has been
1108 the lack of moisture in the soil—the absence of water in the river. This decreased productiveness of alfalfa exists on other lands than those that I own and extends the entire length and width of the valley, I think.

Cross-examination.

By Mr. DAWSON:

When I came here I settled in the town. I have never lived on any farm outside of the town. I have not lived on the farms,
1109 but I have driven to them. I have been engaged in this city and county in the lumber business and in banking. I am still interested in the bank. This part of the country was first settled by farmers—homesteaders—and about the same time the cattle men were occupying the country south of here. I guess the largest crowd came from about 1880 to 1883 or 1884, but they were coming from the time I came here quite rapidly until nearly all the Government lands were taken up.

1110 Kinsley is located at about the 99th meridian. We didn't try to raise crops, only on the river bottom, very much west of here. I think as the country ripens and we go farther west it gets continually better adapted to the growing of crops. I think the river bottom gets the same increase in rainfall that the up-
1111 lands get; practically alike, I think. Possibly in this vicinity the increased rainfall has made the uplands more productive and has off-set or compensated any loss of water that existed twenty years ago, but we haven't enough with all. The diminution of the water from the natural sources of supply might be offset by some present changes of climate, but if we had the same sources of supply in addition, the river bottoms would still hold the same supremacy they had. If we still had the underflow and also the increased rains, I think our bottom lands would be still better than they are. I think the increased rainfall is the result of the growth of timber along the river bottoms; more from this than from any other one cause, as far as I am able to see. The prevailing winds in this section are from the south or southwest or southeast—from the south largely.

There was a time when the people who settled in this immediate vicinity with the expectation of farming got discouraged and
1112 left the country. Probably the greatest loss of population was in 1885 to 1887, 1888, or 1889, or somewhere in the '90's. After that depopulation there was a considerable quantity of land that was sold cheap by those people who were going away. The
1113 great majority of the land was sold to the mortgage companies by lending money on it. The mortgage companies took these lands on the mortgages, and usually they went through the process of foreclosure. Considerable of these lands were purchased on tax sales, not as much here as farther west. I got very little of my land in that way. The greatest rush of people away was during the depressing period, somewhere from 1885 to 1890
1114 or 1891 or 1892—along there. There was a time earlier than that, as early as 1880 to 1883, when a good many went out, and a great many came in along about that time. A great many came in about 1883. I sold my cattle ranch in 1884 at one-half of

what I was offered the year before. That tells the story as well as anything I can think of.

I am of the impression that my first visit to Colorado was in 1875, at the time I settled here. I have the impression that I visited Colorado in 1878.

1115 I have some hearsay knowledge that ditches were being largely constructed in Colorado along in the late '80's. I saw more or less of them. I heard it pretty generally talked and saw it discussed in the papers. I never attended any of the meetings of the irrigations congress or any other irrigation meeting. I had some money in a ditch here at Kinsley; it was for the irrigation of the soil. We proposed to take the water from the Arkansas river by tapping the surface flow. I think the canal has generally gone by the name of the Crawford ditch. (Objection.) I think this was as early as 1879. It headed about four miles up the river, and was completed. It ran to this town. It was at a depth from

1116 about on a level with the river bottom to about 12 feet, and the width was from about 6 to 15 or 20 feet. As I estimate it, it was proposed to cover, say, seven or eight thousand acres. No crops were ever irrigated from it, but the water was turned into it. It ran just as short a time as we could possibly allow it to. It came very near washing the country out. We sent the entire force of the country up there to dam the ditch.

17 We dammed the ditch to shut off the flow of the river into the ditch to keep it from washing the town out here. The current came down the river pretty strong, and it seemed to run in the ditch better than in its natural channel. After that nothing was done with the ditch except to see that it was kept thoroughly closed up at its source. When I first came here the water in the

1118 river would approximate from 18 inches to 2 feet. The water under the soil would be about level with the water in the river, from 18 inches to 2 feet, usually, close to the river, and that made better crops than we would otherwise have had, and it continued to hold that level up until towards 1890—say 1885 to 1890, along there. There was hardly a season when there was no water in the river for any very long continued period up to 1885, and we were practically sure of good crops on the first bottom, unless hot winds killed them. Yes, we had hot winds in those days; they are not as severe now as they were. They would kill a growing crop if it was hot enough.

1119 The lands which this irrigation ditch that I was interested in was intended to irrigate lay on both sides of the ditch, west of Kinsley. They were bottom lands. We wanted the water to make the crop conditions better—to furnish still more moisture. We have always needed more moisture. Kansas is always dry, you know. With the underflow a couple of feet under the ground we were hardly wet enough. I think we can strike water anywhere within ten or fifteen feet of the surface here now on the bottom lands anywhere. I don't think you can strike water on the bottom lands

between here and the river at from two and a half to five feet until you are closer to the river. Probably within twenty rods of
1120 the river you will strike water within five feet. If you sink a well or hole on the bottom about one half mile away from the river, I think the water will show any rise or fall of the river. I don't know that I have ever tried it or that I have ever sunk a hole. I think the water will rise in the hole to the level of the river. I never ran any levels to ascertain that fact; I am using my judgment about it. I have noticed the time it would take the water to show some effect from a rise in the river or a fall. I have noticed that our crops looked greener immediately after a
1121 June rise. We frequently have rains in June. I think there is no doubt that the water travels through the soil, but I can't state in terms its rapidity. I base that upon observation. I think if it was dry and that if during the dry time the river should rise and run bank-full as it has frequently done—I think within twenty-four hours you would see a brighter green on your crops. I think that at least a mile and a half or two miles from the river, and I guess anywhere the width of the river bottom, it would show in twenty-four hours, but I think you would see it very decidedly within a mile or a mile and a half within twenty-four hours. I think my alfalfa shows that perceptibly.

I don't know how the flow of the river is at the present time. If it be true that the channel is practically covered under the
1122 bridge down here this morning and has been that way for three days, then that is a fair flow of water for this time.
1123 Practically, my idea is this, that at all times and under all conditions there is a certain amount of water running under the soil here. When the water in the river is high you will strike that water quicker than when it is low, a good deal. I think we have to go deeper now to get water, as a general thing, than we used to. I think this water comes from the source of supply of the river. I don't know that it comes from the river alone. I think it comes from the source of supply and permeates the whole
1124 country. I think when the water is all taken out of the river it diminishes the supply of water in the soil all over the country that is affected by the river, and I think the river affects the soil. I also think there is a great deal of water derived from the same source of supply that comes from the river—that forms the river—but when it is running and forming a current in the river I think we get more of it than where it is being stopped
1125 and absorbed by the land everywhere. I have never made any investigation or experiment to determine as a fact that this underground water has any perceptible flow. I have observed that it has a fixed current. I have dug two or three holes on the river bottom and the water seemed to come in from the upper
1126 side and flow across. I think when you sink a hole it comes some from all directions. I think the water, as I have found it on these bottom lands, is usually percolating through the soil.

If you dig a hole I think the water would come in from toward the river and from up the river. It would come more from toward the river.

1127 Coon creek here runs practically parallel with the river for quite a long distance. The distance from the river varies. I guess in some cases it is a mile and a quarter from the river. Coon creek heads away up towards Dodge City, which would be west, and it empties into the river about 15 miles east of here. It is between Kinsley and the river, and runs through the

1128 southern part of the town. These bottom lands that I have been speaking of are on both sides of Coon creek. Coon creek used to be a constantly flowing stream; now it runs only part of the time. It is running now comparatively little of the time. There is a little water. I don't believe there is any water in Coon creek a mile west of town. There are holes where there is water in Coon creek west of the town, but there is no running water. I don't believe there is a bit of running water after you get outside of the town limits.

Taking the drainage of the Arkansas river in Edwards county, I guess there is an increase under the plow now over what there was prior to 1885. I should say the increase was probably 15 per

1129 cent. There has been much upland put under cultivation in the last 18 or 20 years, and the bottom lands are kept for hay. Hay is raised there and is worth more than anything else. As to the percentage of increase of lands used for farming purposes, I would say it has been more than 50 per cent. in the last 20 years back to the county line. I think as you increase the lands under cultivation you diminish the run-off of water that falls upon the soil from rain from what it was when the land was in its natural condition. I think this would have so little effect upon the flow of water in Coon creek and in the Arkansas river that it would be hardly perceptible. Of course in cases of flood when there is enough to run off it would, but I don't think there would be any permanent perceptible effect.

1130 I think Kinsley is about 160 miles from the Colorado State line. I think if the ground is cultivated and broken it will absorb more and let less run off into the creek, but there wouldn't be enough anyway except in case of extreme storms to run into the river. If the increase of cultivated lands extends in the same percentage to the Colorado State line I don't believe it would have any effect on the flow of the river. I don't think but very little

1131 of the water of the river comes from the drainage area of the river in Kansas or in Colorado. My idea of the source of supply is the mountains. I don't know but very little about the mountain area which the Arkansas river drains. I have an impression, but I don't know but very little about it. I have seen the river running bank full certainly as far west as Pueblo. The stream is narrower there, but a pretty good, healthy stream. I think the ground water here on the first bottoms would average

about two feet lower than it was the first 15 years I knew the stream, and when I first knew it it was about two feet under the soil.

1132 I have a good many windmills. I counted them up a few days ago, and I think it is 21 that I have. They are not all pumping water from this underflow; some of them are on the upland. Probably one-half of them are on the bottom land. I don't believe the underflow extends back under the up-lands. When we get 15 or 20 miles back I don't believe it affects it very much.

1133 I don't think the water level is higher as you go back from the river. If it should prove to be a fact by actual surveys and levels run that the water level is higher away from the river, it would not affect my opinion as to whether that underground water is fed by the river or derives its supply from some other source. With my observation as it has been, whatever I might learn hereafter would not change the ideas I have previously formed regarding the effect of the river on our bottoms here. If you were to sink to water here on this first bottom where the town is and should find that the water level was a foot higher than the

1134 water level in the river, I would still believe that the water level was influenced by the river. I would think from my observation that the river has a very great influence always on the water conditions in this country. I can't get away from that by anything. I don't think the flow of the water in the river is much affected by the water that falls on the soil in this part of Kansas. We get all that and hold it in the ground very largely, except in extreme storms.

Q. Then your idea is to keep all that water and not let it go down stream, if you can?

A. I think we keep a very great part of it.

Q. Are you one of those who object to our trying to do the same thing—keep that which falls up there in Colorado?

(Objection.)

A. I have always felt that Colorado has a right to take that water. Yes, I have always believed that Colorado had a right to take the water, just the same as I have a right to take it on my land.

1135 I consider the alfalfa to be the best crop we raise along these bottom lands in this part of Kansas. I consider it the most profitable for the uses I can put it to. With the breeding of my fine cattle I think my alfalfa is worth more to me than any other crop, because I can't buy it and I can buy corn. Alfalfa has been, with me, on the average, as sure and profitable a crop as can be raised on the bottom lands in this country. A good many

1136 other men think otherwise. I began cultivating it 20 years ago. My alfalfa crops for the last ten years, on an average, have not been more than one half as much per acre as for the first ten years that I was growing it. I attribute that entirely to the fact that there was but very little water in the river, and that the water

during the last ten years was practically four feet under the
1137 surface while it used to be but two. This year we have had a good deal of water and my alfalfa has shown better. We have had a favorable year this year so far as rains are concerned, with the exception of early in the season. I have not given much attention to the river. I don't think there has been much water in the river. I have been very feeble and for the last two or three months I have not been to the river but once or twice in that time. I think the increased productiveness of the land in alfalfa this year is probably due to the rainfall. I think if we had rain enough we would not need the river at all. I think the same conditions that affect the alfalfa would be very likely to affect other crops, practically about the same, I think.

The value of my bottom lands in Edwards county on the
1138 Arkansas river are as high now as they ever have been. They have increased gradually during the last twenty years with the settlement of the country. There has been more or less increase in the last ten years, not only in bottom lands but all lands—lands everywhere. I think the maximum difference between the high and low water in the river as a rule is not more than three or four feet at the outside.

I was about to say that the largest crop of wheat I have ever known here was raised in 1877 or 1878, but that is not true. There was some here last year that was as high in production as ever known. In 1903 there was a crop of wheat down below here of twelve acres that went 52 bushels to the acre. The average
1139 wheat crop on the bottom last year was good. I guess there was not very much difference between the crop in 1903 and the crops in the early '80's and late '70's. There was considerable moisture last year, so much so that we could not use a threshing machine outfit. I don't know as I paid any special attention to the river last year more than at any other time. The river was dry the great bulk of the year. There has not been near as much water in the river in the winter time at this point as there was during the first ten years I knew the stream. I think the depreciation is fully one half.

1140 Redirect examination.

By Mr. ASHBAUGH:

I think the conditions I have described as to my own alfalfa lands are true of others through this county. I don't believe I am
1141 averaging more than a ton of alfalfa to the acre during the year. I make two or three cuttings a year. That is about one half of a similar crop that I raised years ago. I think I have about six or seven hundred acres in alfalfa now. I think this falling off has affected the balance of the crop as well as mine. Our alfalfa or practically all of it is on the bottom lands. Alfalfa is worth about $5 a ton. That is about the average price. Hay is

produced on bottom lands to quite an extent. This same
1142 condition as to alfalfa extends also to hay lands, I think. I have as much hay land as I have of alfalfa—about 600 acres. I think there is a larger per cent of our river bottoms in hay than in alfalfa. The average crop of hay on these bottom lands now is about half a ton to the acre. This is worth on an average about $3 per ton. I think the falling off in vegetables that are grown on the bottom lands is about the same. I have for the last few years usually had about 200 head of registered cattle. I have about 100 head now. I think that our rainfall is continually increasing—
1143 gradually. Especially is this true in the summer season. I think the level of the river falls before the level of saturation back a mile or two. There might be a very short time before a rise or fall in the river would affect the level back a mile or so (objection), but finally it will level itself with the level in the river. Coon creek does not follow exactly the windings of the Arkansas river. It is a winding stream itself, caused by the difference in the level of the land through which it runs. The drainage does not go directly to the river from the high lands. Coon creek lies in between. Coon creek will rise and run bank full when there
1144 is no water in the river, for a short time. This valley in Edwards county was settled first in 1873. It settled very
1145 rapidly during 1876 and 1877.

Q. In response to a question asked by counsel you said that you considered that Colorado had a right to take the water. You were speaking of a legal right?

A. That was my idea, yes, sir. Oh, I don't think I have the ability to determine the legal right, or the moral right either, perhaps.

Q. Then in all this testimony you have given it has not been affected by any animosity toward Colorado or the ditch companies?

A. Oh, no, I only regret the conditions.

Recross-examination.

By Mr. DAWSON:

I have been in the habit of allowing my alfalfa to go to seed from time to time, and to a limited extent I have allowed the seed to fall on the land. I have usually cut it. I have cut it for the seed and sowed the seed. I think I allowed about thirty or forty acres to reseed itself by falling off. That is guess work, though. I think it is doubtful whether after you once get a stand of alfalfa it is
1146 better for the first three or four years than it is as it gets older. I think my best alfalfa is that which has always been the best. The first crops I put out are the best I have now on two or three pieces. That may be on the best ground. There are a good many things about alfalfa that I don't know. In fact I don't think I know hardly anything of it.

Redirect examination.

By Mr. ASHBAUGH:

1147 I have had a crop of alfalfa seed as high as 15 bushels to the acre and as low as practically nothing.

1148 I consider four bushels a good crop. I have sold alfalfa seed as low as three dollars and as high as nine dollars per bushel, and a good yearly average would probably be about five dollars per bushel. I was at Rocky Ford Colorado, three years ago. I examined one field of alfalfa. The conditions were absolute perfection. I think the man told me that he had thirteen tons per acre from that season's crop, and I think they made five cuttings. As compared with my crop at Kinsley I think I had that year about seven hundred acres of alfalfa, and I think he

1149 had about as much, in tons, on eighty acres as I had on my seven hundred. I hardly think he could have raised any seed under the methods he employed. He had too many cuttings and too much water. His was raised under irrigation, and with perfect conditions. This year I have corn that my men are estimating at forty bushels. Probably there will be twenty-five bushels to the acre. I think I must have at least three hundred acres of corn this year, and probably more. I think my corn on the bottoms has fallen off in the last ten years in the same proportion that my alfalfa has fallen off that I have testified to. I should think that this same decrease would apply to other crops on the bottoms in this county. (Objection.) I don't believe I can give any data as to how much corn there is raised in this county. I would guess a hundred bushels. I think our corn averages fifteen to twenty

1150 bushels to the acre as a general thing here. I have never known corn to sell for less than twenty-five cents here, and from that to fifty. Perhaps thirty to forty cents would be a fair price.

1151 FLOYD E. WELLMAN, Kinsley, Kansas.

Direct examination.

By Mr. SMITH:

I have lived in Kinsley since 1885. I have been farming and in the cattle business. I have been familiar with the conditions in the Arkansas valley and on the bottom lands in Edwards county, and have repaired the two bridges near Kinsley. The south

1152 bridge here is a thousand feet long. The amount of water in the river on the average, excluding the floods, is just one-half as wide as it was at the average flow when I came here. As to the volume of water in the river, we haven't got any, practically, only at certain times in floods, until this year. The flow at that bridge has filled up just one-half the length of the bridge on the

south or east side. The bridge runs north and south. I put in a wing dam on the east side of the bridge. When we nailed the uprights onto those timbers that are fastened we had to work in the water. The water just came up to my chin when we were
1153 putting in those planks. The object of putting the wing dam in was to keep it from washing out. Now it is all filled in pretty nearly to the top of it with dirt and trees and everything else but water. This filling extends probably three hundred and fifty to four hundred feet there at that place at the south side of the bridge. There is a wing on the west end of the bridge also. That is, all the water there is on the west half of the bridge, and that wing is in the water. The ground that has filled in has grass and trees growing on it. It is not cultivated or anything; it is all grass. I couldn't say that there was any fence on it. The water in the river on the average as compared
1154 with what it was when I first came here, excluding floods, is probably one-fourth. I first noticed the decrease in the flow somewhere about 1890. During the years when I first came here there were no months in the year when the river was entirely dry. I have never seen during those years very much difference in it through the summer season. Generally there was about a foot to two feet of water in it at that time. The particular time of what is known as the June rise in those early days came when the snow began to melt in the mountains and we would have a flood, that is all. We haven't had many rises lately.

1155 I am familiar with the crops grown on the bottom lands. We used to get about a ton of prairie hay to the acre in those early days. Now it will run eight to ten hundred pounds, generally speaking, on the bottom. I have had considerable experience with alfalfa, and it is not nearly as thrifty as it used to be. The production of alfalfa on the bottoms now I wouldn't want to put over one-half as good as it was thirteen or fourteen years ago.

I have had occasion to notice the underflow, particularly along on the north side of the river, and also here in town. There
1156 is some curent to it. It is enough so that you can notice it. I have noticed that in digging wells here it always clears on the upper side first. By the "upper side" I mean up the river. When it is all stirred up, when you are digging and get done, it begins to clear, and that always leads me to think there is a current there. It goes out on the other side, because it clears on the up side first. This underflow is not now as close to the top of the ground on the bottoms as it was when I came here first. It is about two feet lower. We do not get water in the wells at the same depth we did fifteen or twenty years ago, by at least two feet, and in some places it is more.

This filling in of the river was a natural filling—not arti-
1157 ficial. The cause of this filling in is that sand blows in there and I know that when we get these high waters coming down here there is always a great deal of sediment left in the river when it

goes dry. I noticed this process of filling in more along about 1890, and it has been gradually filling since then. The river began to fill up about the time the flow began to decrease. (Objection.)

Since 1890 we have had very few June rises, until the year
1158 1904. The biggest one we had was in 1895. The water in wells and excavations on the bottoms here rises and falls with the rise and fall of the river. (Objection) When I lived up the river we used to put a box down in the dirt. When the river was running full that water would come up and that is where the cattle got their water. When the water would go down in the river there would be no water there. Now they have to use a wind mill where they used to use those boxes. That is about half or three quarters of a mile from the river.

Cross-examination.

By Mr. HAYT:

I came here from Wilson county, Kansas, when I came to this place. I lived in Wilson county, I think, about three or four
1559 years. Before that I lived in Miama county, Kansas, two or three years, and before that I came from Independence, Iowa. Up to the time I came here I had been following about the same occupation I have here—farming some. That has been my principal occupation, but I have been at other jobs outside. I have handled stock ever since I have been here, mostly raising stock and handling them some of the time, and worked for cattle men here.

1160 I have dug wells and cisterns here, and I have dug cellars here. Most of them have been here in town between this and the river. One of them is on the city park or race tracks. These cisterns were in town here. We stopped before we got to water. We bored to the water for the cisterns. Of course we would have to stop before we got to the water. You can't go to that. I may have dug ten or fifteen wells here. Usually when we
1161 came to the level of the river we found water in these wells. We have never run any levels to find whether the water we struck in the wells was the same level as the water in the river, but they have run lots of levels here to find a place of drainage. I have never investigated this water level outside, away from the river, farther than this town. They have run levels here to see if they could get drainage, and I have seen it done. I think I have never investigated enough to say how this water level compares with the water level in the river. In digging these wells I could generally tell about what I had to do to get water. I think I understood it all right. If there was a rise in the river it showed in a very short time on those boxes we used up on the bottom
1162 here. I couldn't set any definite time as to how long it took it to appear here in town, because I never investigated it thoroughly.

These boxes I spoke of as having been put in one-half or three-quarters of a mile from the river were put in on the ordinary level. There is no low place along there. A rise in the river would show in those boxes in a short time, not over two or three days. If the water receded in the river I suppose it would lower the level in those boxes some in two or three days. I know we always knew the river was going down as soon as our water was going, whether we would look at the river or not.

1163 One of those bridges I spoke of is located east and the other south of town. The east bridge is about two miles from this building and the south bridge probably one-fourth or one-half a mile farther. These bridges where the river runs are about a mile and a half or two miles apart. We have had considerable water this year. When it rises here, from two to three days we have a rise in the river. This year it has been there in the month of June that way, not very long but most of the time. There

1164 is no difference in the channel of the river at the south side of the bridge, only that it has filled up. There was a channel clear across it in those times. The main channel was not on that side of the river. Whatever channel was on that side has filled up. It has narrowed the river just half on the bridge. This building here where we are taking testimony is located on the corner of Marsh avenue and Sixth street in the town of Kinsley.

1165 I have been up in the mountains and I know something about the snows melting in the mountains. I have been there several times. The first time I was ever up there was in 1890, I believe. I crossed the Arkansas river right below Leadville. They called it the Arkansas junction there. That was in the latter part of June. The river was not full, but there was con-

1166 siderable water in it. I didn't see the river after that time that year until late. I have seen the river right close to the head waters at another time, but I don't remember the year.

In speaking of the hay crop in the bottom I am speaking of the hay crop as a general thing. I have a hay crop myself. It goes from eight to ten hundred pounds to the acre this year. That is about an average this year, and a pretty good average too. The hay crop in this locality is considerably better than it was last year. I raised some alfalfa. Our alfalfa is better this year than last. We have had more water on it. We have had some rain. I

1167 don't know whether we have had any more or not. We don't have a good hay crop or good alfalfa crop when the water in the river at this point is low. In my experience it has not rained enough to do it good, although it might. I know we have had probably more rain this year than we have had before for some time. They raise crops here sometimes without water from the river. We don't have good hay crops here any more. If there

1168 is plenty of water in the river we get a fair hay crop. We used to have good hay crops when there was lots of water in the river. When there is plenty of water in the river we most

always have rains. I suppose the farmers back in the country in this vicinity depend largely and generally upon rainfall for their crops. If you were asking me about both the bottoms and the uplands, I don't know anything about this. As to whether we have plenty of water in the river when we have plenty of rain, that is what causes it, maybe. You take it in the rainy season, and there is plenty of water in the river, and there is plenty of rain,
1169 but we generally get the water coming down in the river first before the rain starts. When we dig a well I don't know that the water comes in from all sides. The water is there when you get to it. It doesn't come in. It always clears on the upper side of the well, that is, the side up the river, as far as I have
1170 had any experience with it. That is the only circumstance from which I conclude that the water comes out from the river into these wells. These wells are in this township, I think in the northeast quarter of section 18, township 24, range 19.
1171 That is southwest of the town right up along the river. It is between Coon creek and the river. The river and the creek are about a mile and a quarter apart there, and it is about half way between.

Redirect examination.

By Mr. SMITH:

When we have local rains here I don't know as it raises the
1172 river any. I think local rains don't raise the river here. The floods that we have in the Arkansas river when it rises come from up the river.

Recross-examination.

By Mr. HAYT:

I have never been up the Arkansas river above Pueblo. I know that the river has a large drainage above here in Kansas, as well as in Colorado outside of the mountains, that it drains a large area in Colorado and Kansas. I know also that when they have a big flood up there and the railroad washes out, in about a week we have a big flood here. That is in dry times. It takes it about a
1173 week to get here. We have had rises in the river here right along this month. We have one now that came up here Sunday night. I don't know where that originated. It takes a flood longer to come down when it is all dried up. I don't know of any streams in this county that discharge into the Arkansas river.

1174 D. D. BAXTER, Kinsley, Kansas.

Direct examination.

By Mr. SMITH:

I am the county clerk of Edwards county, and as such county clerk I have in my office the returns of the township assessors of this county, showing the acreage of the various crops of corn in this county from year to year. These returns show the total acreage of alfalfa in Edwards county for the year 1896 to be 4,976 acres. The latest record is for 1904, and this record shows the acreage of alfalfa for 1904 in Edwards county to be 1,777 acres. These records are compiled by the township assessors of Edwards county, and are returned to the secretary of the board of agriculture of the State of Kansas.

1175 Cross-examination.

By Mr. DAWSON:

The only reason I can see for the falling off in the acreage of alfalfa between those two years is because it has not been a profitable crop between that time and this. (Objection.) The crop increased from 1896 to 1898. In 1898 it was more than six thousand acres, if I remember right, but from that time to this it has steadily decreased every year so far. I have the other books for the years intervening.

(By request of counsel for the State of Colorado, the witness produced the records of the township assessors for Edwards county from the time when the records were kept down to and including the year 1904, showing the acreage of alfalfa, wheat, corn and oats, which records show as follows:)

	Alfalfa.	Wheat.	Corn.	Oats.
1886	None reported	7338	21254	5559
1887	" "	2395	2100	2100
1888	" "	32091	24762	5975
1889	" "	3397	23100	5428
1890	" "	9291	20583	6030
1891	" "	19564	13596	7304
1892	451	29923	12899	8114
1893	481	40739	11512	9363
1894	1155	45415	14841	6263
1895	2088	47479	20346	8658
1896	4976	40024	20789	10425
1897	2930	37052	23595	6507
1898	6923	47916	18747	5427
1899	4801	47644	19374	4293
1900	1961	43525	25032	5145
1901	1776	58668	20396	5784
1902	1559	69182	21945	4734
1903	1724	58481	20079	7216
1904	1777	130165	23396	5311

1180 These records which I have been reading from are such as by law we are required to keep in our office.

1181 WILLIAM H. VERNON, Kinsley, Kansas.

Direct examination.

By Mr. SMITH:

I have lived at Larned, Pawnee county, Kansas, since October, 1875. I am familiar with the bottom lands in Pawnee county, which are practically the same as the bottom lands in Edwards county. The first bottom lands in Pawnee county, I think, average from three to five miles wide. I have observed the flow and volume of the Arkansas river frequently since I have lived here.
1182 From the time I first located in Larned until, I think, in the late '80's there was quite a volume of water in the river. It was flowing all the time. Since that time the normal condition of the river has been dry—no water in it at all. In those early days I should say the width of the river was eight hundred to a thousand feet, somewhere along there. During those early days the average depth was probably from one and a half to two feet. That would vary very much. In places it would be very deep and in other places very shallow. The average across the bed of the river would probably be one and a half to two feet. The bed of the river has changed very materially through Pawnee county, in fact it is very much narrower than it was, and it has filled up until there is hardly any river there. It has willows and brush grown in the river, and it has filled up with sand until it is practically almost level with the country. It is difficult to see there was a stream, almost, at places. I can't fix the date exactly when I first noticed this diminished flow, but it was probably
1183 in the late '80's. During the first years after I went there the river was fairly well stocked with fish. There are no fish in the river there now and have not been since the time it first went dry. At the time it first went dry in our country there was a great many fish caught in little pools where it dried up. They got them by the fork load and wagon load and hastily constructed seines. There were all kinds of fish. I think there has been no fish at all in the river since that time.

Alfalfa is principally grown in Pawnee county on the river bottom—I think in fact altogether in the river and creek bottoms. Wheat is principally grown on the uplands. The principal crops upon the bottoms would be feed crops and corn. Feed would include alfalfa.

1184 Cross-examination.

By Mr. HAYT:

If I am correct, the first time that I ever noticed the river going entirely dry was some time in the late '80's. There were times, of

course, when the river would be low, but I think it was alwas a running stream. I didn't hear that the river was dry in 1874, and I hardly think it is possible that it could have been, on account of the fish in the river.

I am about fifty-three years of age, and am a lawyer by occupation. I have practiced law at Larned since I located there. I studied law at Lawrence, Kansas, and was in a law office there
1185 perhaps six or nine months before I located at Larned. I have had no interest in the agitation which has resulted in this suit, further than the interest that the citizens of this country generally take in the matter. I have heard it discussed and have discussed it. I know that the claim is generally made that the river is dry because Colorado has been taking the water, and I know from observation that it is practically true. I went to Colorado in the summer of 1893, in the latter part of June, and the first water
1186 I discovered on the trip was some place in Colorado towards the mountains. I went up the Arkansas as far as Pueblo and went from Pueblo to Denver. My recollection is that there was quite a stream of water in the river at Pueblo and for some little distance this side. I don't remember how far this side. I was up there once or twice shortly after that, and in fact took evidence in Lamar and La Junta, and of course observed it at all those times, but I couldn't fix any particular date. In the winter months from November until April the river here is practically dry or in a low condition. In the early years after the summer flood the river would go down and would be in a low condition during the winter months. It would be in a low condition from that time up to the next flood, the next summer. We had a flood each season in the river when the river
1187 would be bank full. In the early years it was a running stream during those months, and it has a dry bed now. I don't think the water runs here during most of January, February and March. There may be water occasionally in little pools and places, but it is not a running stream. The main irrigating ditch in our county was commenced and pretty nearly completed just before the river went dry, and the work stopped on account of the river going dry and has never been resumed since. (Objection.) I only remember that one ditch at that time. That
1188 was quite a ditch. It was taken out from the river somewhere near Garfield in our county, close towards the west line of the county, and extended down practically to our place, some ten or twelve miles in length, I should judge. I think the ditch was probably ten or fifteen feet wide, somewhere along there. At one time when they took the ditch out from the river they got a little water for some time in the ditch, but not to the extent of the ditch. I think besides that there was a ditch that entered the river in the east part of our county that was
1189 taken out much later than that, for the purpose of carrying water to the Cheyenne bottoms, north of Great Bend.

The rise in the river usually comes from the latter part of June

up to probably the first of August, when we have high water in the river. Sometimes it may come a little earlier and sometimes later, from the middle or latter part of June until the first of August. The river has been up this year, and I think there has been a rise in the river every year ever since I have been there. I don't remember a year that there hasn't been. It is usually between the times I have mentioned. During that period the river usually runs some water all the time, and frequently it is quite high. It gets bank full, and sometimes in our county it overflows a little.

1190 Redirect examination.

By Mr. SMITH:

We invariably had wet weather at the time of the rise in the river. We would have our wet season. I don't think these wet seasons now come with any regularity at all. I think there have been times when we have had, but there is no regularity now in having a wet season at the time of the rise in the river. I think this was invariable every year during the early years. I don't know of a year we didn't have it in the early years. It is my recollection that when I went to Pueblo in 1893 I saw some irrigating ditches at that time.

1191 During the early years the June floods would continue from two to four weeks according to the best of my recollection.

1194 I have been in the real estate business somewhat as well as in the practice of law. During the first ten or fifteen years after I came here, where the bottom lands and uplands were equally distant from the city in location. I would say that the bottom land was probably worth in the neighborhood of three times the value of the upland. (Objection.) During the last five or ten years I should say there was no practical difference, if the lands were lo-

1195 cated equally distant from the market. I attribute this comparative change in the relative values now to the fact that the continued productiveness of the bottom lands had been disappointing and the productiveness of the uplands had been greater than was anticipated, and to the fact that the uplands are much better for wheat.

Recross-examination.

By Mr. DAWSON:

From my observation it has proved to be a fact that the uplands raise better wheat than the bottoms. I rather think the soil of the bottoms is too sandy. It is not of a nature to produce wheat as well as the upland. I think the bottom lands are largely made up of the same sandy constituents that the river bed itself is. I don't think at an early day the uplands were so well adapted to wheat, because

the rain fall at an early day came more in a bunch than it
1196 has later. It was not so well distributed during the year. The rainfall of late years has been better distributed throughout the year.

DODGE CITY, KANSAS, Aug. 26–29, 1904.

1197 ROBERT N. WRIGHT, Dodge City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Dodge City, Kansas. I helped lay out Dodge City in July, 1872. At that time I was residing at Fort Dodge, about
1198 five miles east of Dodge City. I am sixty-four years old, and came up the Arkansas river first in 1859. My business has been diversified; I was formerly a freighter, stock raiser and merchant. I first freighted up the Arkansas river. For two or three years I supplied the Overland Stage Company's stations with hay and grain from Fort Larned, Pawnee county, Kansas, to old
1199 Fort Lyon, Colorado. Old Fort Lyon is west of Lamar, I think, on the opposite side of the river, twenty miles west, I think, of the mouth of Big Sandy creek.

I was along the Arkansas river a great deal of the time from 1859 up to 1885, and was pretty familiar with it, and I have lived practically on it ever since. During the last few years I have been farming on the river bottom near here, and have been commissioner of forestry for the State of Kansas. The bottom lands near the city of Dodge are about a mile wide. In some places it is wider and some places narrower. There are two bottoms. The second bottom extends to the foot of the hills, which we call the bluffs. Above the
1200 bluffs it is prairie, and we call it upland. The second bottoms rise gradually up from the first bottoms and are not a great many feet higher. During the first twenty-five years that I knew this river the average flow, excluding the periods of the floods and freshets, I think was about two feet deep and perhaps a couple of hundred yards wide. The average flow of the river during the last ten or twelve years, excluding flood and freshet seasons, I
1201 think has not been half as great as it was formerly. During the last ten or twelve years the river goes dry very frequently. That condition depends upon the season. Most of the time it is dry, I think one-quarter of the time during the summer. During the first twenty-five years that I knew the Arkansas river there was always a period known as the June rise, which was the flood from the mountains, almost exclusively from the mountains—the melting of snows. It was generally at its height along about the first of July here, and that period lasted six or eight weeks from the time it reached its maximum. It would gradually rise in June, but the height of the flood would be about the first of July. During those

times the water would come to the top of the ground in the low bottoms.

1202 As to there being such a thing known as an underflow, why, I have never heard that disputed but what there was an underflow. (Objection.) I mean that—in my opinion there certainly is an underflow. Along about twenty years ago they were building a ditch on the south side of the river, the head of which ditch was about twenty miles from Dodge City. Before they got to within seven miles of the head of that ditch the underflow was so great in excavating that *that* it would swim the mules, and they had to take out a waste-gate about two miles this side of that—about nine miles this side of the head of the ditch—to let that water off before they could go on with the excavation. It would take the mules up to their bellies, and deeper, and there was quite a flow to it, and they dug down and put in what they call a waste-gate to take surplus water off. The underflow extended as far back as the bottom would extend. As to how deep you would have to dig in the early years before you found the overflow was of course in accordance with the amount of water in the river. Sometimes you would only have to dig one or two feet when the river was at all full, and as the river receded you would have to go deeper.

1203 The underflow rose and fell with the water in the river. I think there was undoubtedly a slight current to the underflow in the direction of the flow of the river—generally east along here—in an easterly direction. As to the effect the underflow had upon the production of crops upon the bottom lands, it certainly was a sub-irrigation to crops. These bottom lands during the early years were mainly natural meadows, and the crop we raised was hay. There is hay raised on these bottoms now, but I don't think one-half as much as formerly. This is, I think, from the lack of water or moisture from underneath. There is alfalfa raised on these bottoms now. They began raising it about twenty

1204 years ago. I think the alfalfa grew more luxuriantly then than it does now, perhaps nearly one-half more, because it had more moisture then than it has now. There is not a great deal of alfalfa raised on the uplands. There is not much of the uplands that is suitable for alfalfa. Alfalfa raising is confined almost entirely to the bottom lands.

The diminution in the flow of the river and the lowering of the underflow became noticeable, I should think, about fifteen years ago. It was not sudden but was gradual. The lowering of the underflow has had the same effect, I should judge, upon other crops raised in the valley. The other crops are principally oats and barley. This is not a very good vegetable country, although

1205 they sometimes raise a good crop of potatoes, but they have never been planted to any great extent.

Cross-examination.

By Mr. HAYT:

I came here in 1859 and struck the river at what they call Great Bend, about where Ellinwood in Kansas is. The bottom lands I suppose are two or three miles wide there. At that time I was freighting to Pike's peak. I was not quite nineteen at that time.

I had my own team, three or four oxen and a wagon. I was
1206 freighting in connection with others on that trip, and I went to Denver and to the mountains up there. I landed in the summer of 1859 in what they call California gulch. I have never been up there since. After we struck the river at Great Bend we continued right along the river until we got to Pueblo, where we left the river and followed the Fountain. It was about the first of May we struck the river down here at Great Bend, I think, and we were possibly four weeks going to Pueblo. I made the next trip with my family, with an ox team, in 1862, up the river over the same course, only to Canyon City. After 1862 I freighted vegetables from Canyon down to old Fort Lyon for two or three years, then I brought
1207 a herd of cattle out from Missouri. That was about 1864 or 1865. After that I worked for a year or two for Barlow, Sanderson and Company, the old Overland Line Mail Company. I was passing up and down the river then quite often from that time. It was two hundred and forty miles from Fort Lyon to Larned, and they had no stations between. I put in all the stations for the company and supplied them with grain and hay, so of course I have been on the river a good deal of the time both winter and summer. That was from 1866 to 1867. After that I lived right on the banks of the river at what they called Cimarron crossing, about three miles west of the town of Cimarron, Kansas,—where the town of Cimarron is now. That is about twenty miles from here, up the river,
1208 or thirty miles from Garden City. In 1859, along in the fall, the river got pretty low, in September. In those early years the river went dry once every three or four years along in September. I don't think it went entirely dry in 1859, but I don't know. For a short time in the fall it was pretty nearly dry, so that it only ran from one puddle or hole to another in small channels, and once in every three or four years it went almost entirely dry, in the early years. In those early years we didn't have any difficulty as a rule in high water in crossing the river whenever we wished, on horseback or otherwise, but the river kept up a good deal longer than what it does now, from what we call the mountain rise or June floods. When I first went up the river in 1859 I thought
1209 then it would never be inhabited. The country has improved very much more than I or the most sanguine expected at that time that it could improve. There was no habitation along the banks of the river or in sight on that trip except a little trading post at the mouth of Walnut creek at Great Bend until you got to what we called Fountain City. That was on the east side of the Fountain. There

was no Pueblo then. That was just at the mouth of the Fontaine Qui Bouille, on the east side of the creek, where Pueblo is now located. In that year 1859 when I passed up the river it was not dry or nearly dry in places, when I came out in the spring. When we went down again in the fall it was dry in places; that is, the river was low. I went down about in September. I know
1210 there wasn't a great deal of water in the river. But when we went up the river was full all the way up. There was a great difference between the time we went up and the time we came down. My recollection is now that when we came down there was not a great deal of water in the river from Pueblo down as far as we followed it, but when we went up in the spring there was a good deal of water all the way up as far as Pueblo. I didn't see any cultivation at all at the mouth of the Fountain that year, although I was told that the Mexicans had a little garden there. I suppose they irrigated it. In 1862 and 1863 in Colorado I first saw crops irrigated. That was on my second trip. I saw crops grown by irrigation at that time this side of Canyon City, from Canyon City down to Pueblo, on the Beaver creek, and along through there. I
1211 think it is about fifty miles between Canyon City and Pueblo. There was not a great deal of cultivation there until you got up about Beaver creek. It was about half way, I guess. From Beaver creek up it was all cultivated. They had nice farms all along. The river bottoms were all cultivated, that is, where I freighted vegetables to Fort Lyon for a year or two. They always raised crops by irrigation at that time. I saw irrigation ditches at that time. They were individual ones—small ones. Each man had his own ditch two or three or four feet wide, something like that. I saw them when they were running water, and there were quite a good many of them, and a good many little farms in there in those early days. The crops were very good, the finest vegetables I
1212 ever saw raised. During those early years I used to fill the Government contracts for hay at Fort Dodge, and the grass from Great Bend up to Pueblo—the hay in the bottoms—was more than twice as heavy as it is now. There was none on the uplands. There was no stock in the country at that time to eat off the grasses in the bottoms; nothing but the buffaloes. There was buffaloes here.

In those trips I made up the river in Colorado I have been to Leadville, but never went to the extreme head waters of the Arkansas, that is, to the extreme fountain head. The first time I went up as high as Leadville, was, I think, about 1863. I wasn't mining; I hauled vegetables up there. It was called California gulch at that time. In the parks—in South park, above the cañon, up towards Leadville, where the clumps of timber were there were very heavy clumps of timber, and around California gulch on the hills about there there was a good deal of
1213 pretty heavy timber. The gulches generally up through that country in the mountains, below timber line, were pretty

heavily timbered in those days. The first time I ever saw South park it was one of the most beautiful spots I ever saw. It was just a waving meadow, surrounded by clumps of trees, and a stream of water running right through it, right on top of the ground, with a pebble bottom, just as fine as it could be. I have not been up there for a great many years. One of the things that attracted my attention was this growth of timber, after coming up through a treeless valley, and this beautiful meadow. It looked like a garden or an immense meadow. The timber was particularly striking. I was through there later when there was two or three feet of snow, and I was hustling out of there and we had to just go wallowing through there to get out. I have not been through there since the timber was cut off. I don't think there was any farming in 1862,
1214 much, on the Arkansas, but they were farming on the Fountain, which is a tributary of the Arkansas river. Beaver creek is another tributary. I never noticed the farming on the Arkansas about the mouth of the Huerfano very much, until the spring of 1863, when there was some very large farms opened up and some irrigating ditches established. As early as 1863 there was one, which we called Haines' ditch. All the farming I saw in Colorado was carried on by means of irrigation. They commenced farming down about Bent's old fort a good many years later, and I don't remember of any farming there except what I have seen since the railroad has been built, passing through. I am speaking of both Bent's forts now—the upper and the lower. I don't remember seeing any considerable farming there until after the Santa Fe
1215 railroad was built, several years. The Santa Fe was built about 1874. After 1874 I passed along the river into Colorado occasionally on the railroad. I have not been up the river except in the night time. As a general thing I leave here about ten o'clock at night and get to Pueblo for breakfast, and then we leave Pueblo in the night and get here about sunrise in the morning, so I don't know anything about the farming up there only what I have seen at night out of the car window, by moonlight. I have heard that they are farming up there more and more extentively every year, but to my personal knowledge when I used to go up there and knew the country there were no crops in at all at Bent's fort.

The June rises in the river continued longer in those early days than they do now. We have them more or less every year.
1216 Most every year we have more than one full river, and nearly every year during the last ten years at some time between July and August there is considerable water running down the river by Dodge City. Sometimes almost every year the river goes dry at this point, but during most of the season there is some water running in it. Either in 1863 or 1864, in the fall, I remember particularly that the river was dry. It was a very dry year. In 1874, if that was the grasshopper year, it was a very dry year. The river may have been dry about the year 1874 during a part of the season for one hundred or one hundred and fifty miles, including the

river by Dodge City. I remember that we had a dry year then about that time, I think, but whether it was 1874 or 1875 or
1217 1873—it was along about that time. There were some other years about that time when the river was dry for long strenches, but not many. That happened in those early days.

I was a witness before a committee of the United States Senate when it visited Dodge City some time in 1889, and perhaps it is true that I said or it was stated at that time that there had been three crops of settlers in here at that time. As I recollect, these people were coming in here in great numbers from time to time endeavoring to raise crops, meeting with failure and going out, and others coming in to take their places. If I could recollect the birth of Garden City I could about tell you when the first crop of set-
1218 tlers came in. I think that was about at its height in 1884. When it started I do not know. It was in the early '80's. At the time they came in this land was settled upon and homesteaded and preempted quite largely. It was nearly all taken up. And these people afterwards moved away. And in the fall of 1889, when this committee of the Senate visited this place it looked pretty hopeless here so far as the cultivation of crops was concerned. I have forgotten what the object of the Senate committee was, but I remember the Senate committee and remember testifying before it, but what the questions were that were asked me I have forgotten. I think Senator Stewart of Nevada was one of the members, and Senator Plumb was with them. I don't recollect of them asking me how the sheet of water could be gotten out upon the tillable lands for the purposes of irrigation, but I think, since my memory has been refreshed, that that was part of the subject under
1219 discussion at that time. I recollect that various schemes were advanced for bringing this water to the surface, among others that of gathering this water under the river and gradually bringing it to the surface by means of ditches. I think that was discussed. I think the first irrigation ditch in this country was taken out about twenty years ago. (Objection.) That was about 1884. That was the Eureka ditch, if I am not mistaken. (Objection.) It is also called the Soule ditch. I think that was taken out in 1887. They were several years building it. I think they got
1220 the water in it in 1887. I would have to guess at the width of the ditch, but I suppose it would be twenty-five or thirty feet at the bottom. It was a very large ditch and ran along the foothills. (Objection.) The slope of the banks would depend on the digging. I suppose it sloped at an angle of forty-five degrees. I couldn't tell you exactly how wide it was at the water line in high water in the ditch. I will describe it as best I can. I think it was about twenty-five or thirty feet at the bottom of the ditch. It was three to five feet deep, and had a fall of three or four feet to the mile, and ran a mile north of Dodge City. The main ditch was

about seventy-five or a hundred miles long. It had a good
1221 many laterals, but these I couldn't describe. It was to water land on both sides of the ditch, but on the north side of the river. It was between seventy-five and a hundred miles long. It was supposed to be right on a ridge, so as to irrigate both ways. The underflow ditch was taken out about 1888. The Eureka
1222 ditch ran alternately for two or three years. At first, you know, when they would put water in it, they would find a break in it. It would run down twenty or thirty miles and they would have a big break or something of that kind, and then they would shut it off and maybe they would run it again that season and maybe they would not. Maybe the break would be so great that they could not run it again that season. But for two or three years it ran full of water. The ditch on the south side was lower than the Eureka ditch. It was supposed to be an underflow ditch entirely. They met with some success in getting the water out and irrigating a considerable amount of land, but they didn't think it was sufficient, and in my opinion they spoiled the ditch by cutting into the Arkansas river and trying to make it work both ways by taking not only the underflow but the water out of the Arkansas, and it covered it up. I think they were a little too greedy. This ditch was completed for about twenty-five miles and partially
1223 completed for about forty-five miles I think. It was about one-half as big as the Eureka ditch. Down here I should judge it was twelve feet wide at the bottom, and perhaps carried water to the depth of two feet. That is thirty miles below its head. It ran within a mile and a half of Dodge City, to the south. I was interested in one of these ditches to this extent: I bought a whole lot of fifteen dollar or twenty dollar land after they showed me it was going to be a success, but I didn't blame them, and the land was sold afterwards for taxes. Pretty much all of the bottom land here is now under cultivation, and most of the second bottom. I should say the second bottom averaged a mile and a half in width. They also raise crops on the uplands, beyond the second
1224 bottom. They raise better crops here now on an average than ever before, on the uplands. Well, I would hardly say that the lands generally here are better for cropping purposes than ever before. They are cultivating more land, and with the exception of this year they have raised better wheat than they have heretofore. But this year the rust struck it. The values of land here are generally higher than ever before. They have been steadily increasing year after year for twenty years, with the exception of the fluctuation by reason of booms and their subsidence. They are taking water from the lands adjacent to the river here by means of wind mills, and from the uplands too. They have no other machinery for that purpose but the wind mills. It is a wind mill country. There are two large plants here at Dodge City
1225 pumping water—the Santa Fe railroad and the Dodge City water works. The city plant is located in the bottom west of

town. The wind mills are in general use in the country. It would be a hard matter to say how many. Nearly every farmer has a wind mill pumping water out of the ground. I would not
1226 say that there are as many as a thousand of them. There are possibly five hundred. The water is used for domestic and stock purposes, and in a very few cases it is used for irrigation for little garden patches. It was in 1889, I believe, that the Senatorial committee took evidence at this point.

(At this point counsel reads from the proceedings of the
1227 Special Committee on the Irrigation and Reclamation of Arid Lands, of the United States Senate, as reported by said committee, volume 3, pages 154 to 156, inclusive, as follows:)

"The CHAIRMAN: Have you observed the efforts made to cultivate the soil in western Kansas without irrigation?

Mr. WRIGHT: Yes, sir.

The CHAIRMAN: Have they been successful?

Mr. WRIGHT: They have not.

The CHAIRMAN: Describe the efforts you have made, and whether people have remained or not as a consequence of those efforts.

Mr. WRIGHT: As these gentlemen have explained to you, two or three crops of emigrants have come to this country in the last twelve or fourteen years.

The CHAIRMAN: What do you mean by 'two or three crops of emigrants'?

Mr. WRIGHT: What I mean by that is this: Different batches of emigrants have come into the country and about half of them after two or three years' trial have left. Some stay a little longer than others. Some have remained four or five years and have then gone away and a new batch has come in. That has repeated itself I think three or four times since I have been here.

The CHAIRMAN: Is it possible to farm in this part of the country, the western part of Kansas, west of Great Bend, without irrigation?

Mr. WRIGHT: It is only partially possible. They raise a very sorry crop here without irrigation.

The CHAIRMAN: Can a family make a living on the ground by farming?

Mr. WRIGHT: Not one out of five I should say. The rain comes in streaks here. Some cultivate the soil a little better than others, perhaps, and a few have made money, but they are the
1228 exception."

That correctly described the conditions that existed up to that time. We had in those days good farmers and poor farmers. Some of the good farmers made a success of it, made money, and the poor farmers failed, and fail now. I think there is no doubt that there has been a general improvement in this country in the raising of crops since this evidence was given in 1889.

I don't know whether this ground water was commonly known

as sheet water in this locality up to 1889 or not. Some thought it was sheet water and some thought it was an underflow. I guess I first heard the term underflow used when they were starting
1229 to take out this South Side ditch. Whether it is called sheet water or ground water or underflow, I mean the water that fills the sand and the gravel of the river bed and the uplands below a certain depth on either side of the river. It is water taken up by the sands and moved slowly off. It is slowly percolating through the sand and gravel beneath the surface. It has a flow to it, of course. It is sluggish, no doubt, and does not have the velocity that the river proper has. I think it moves a good deal faster than 10½ feet per twenty-four hours. I base my judgment on see-
1230 ing this water moving in open cuts or ditches after it has been freed from the sands and gravel of the country. I have never made any investigations to determine whether the level of the water is higher or lower than the water flowing in the river. On Cavalry creek, from fifty to a hundred miles south of here, and several little creeks whose names I have forgotten, I have seen streams breaking right out there into quite nice large size brooks, and I believe that was the underflow from the Arkansas river; that it found its way through some soft or gravelly channel. There are three or four streams down in that country. There was really no rain there then; the country was very arid and warm and dry and hot and parched up. I have not been over there for thirty
1231 years. These were about twenty-five to thirty miles from the nearest point on the Arkansas river. The intervening ground is filled with sand hills, nothing out of the ordinary. This experience led me to the belief that the ground water extended from twenty to thirty miles away from the river. These streams were many feet higher than the Arkansas river, taking it right at the nearest point to the river, and that is what led me to the belief that these streams were an underflow from the Arkansas river. We will say that the Arkansas river has a fall along here of seven feet to the mile, and it led along until it was in a channel, until it found its way out down there. In my judgment it came from the
1232 Arkansas river, possibly a long distance above. There was no other source that I could see except from the river.

I testified before a Senate committee in 1889 that there was a well here three or four hundred feet from the river, and I venture to say that the water in that well is three or four feet higher than the water in the river. At different places as you go up the hillside that increases. I think that is true now. I think possibly that within two or three or four hundred feet of the river you can find the water level four feet or more higher than the water in the river, and I think that it is from the underflow. In my judgment this underflow comes from the entire drainage of the Arkansas river. For instance you might dig a well a hundred yards from the river
1233 right directly north or south of it. It would not indicate that that well would have to be just the level with the river either

way, but it is liable to be, and I think the water came from above, and would be higher than the Arkansas river. As the water drains from these high lands on either side of the river, it strikes this well.

1236 There are more or less sand hills along the south side of the river from Great Bend until you get into Colorado. There is the best natural road up this Arkansas river to the mountains that a man ever saw, on the north side of the river. On the south side you couldn't build one on account of these sand hills. That shows that the north wind is the prevailing wind, and heretofore in the early days the river was a great deal lower in the winter than in the summer, therefore the action of the wind had the greatest sweep on the sand bars and swept the sand south. In my opinion the sand hills are formed by the sand from the river, blown out of the bottom of the river.

I don't know of any places here within ten or twelve miles of the river where the water level is twenty-five feet higher than the

1237 water in the river. (Objection.) Now, east of here and a little north, five miles and nine miles, there are pools of water up there, quite deep pools, that from the looks of it must be twenty-five or thirty or forty feet higher than the river. I don't know what forms these living pools up there unless it is this underflow. I don't know anything else that forms them. I should say they were twenty to twenty five feet higher than the river.

1238 In the early days there was very little timber between Great Bend and Dodge City, and up to the Colorado line and above. There were a few scattering very large trees. Now from Great Bend to Pueblo there is a great deal more timber on the river than there was then. The reason, I think, of this is that the fires are kept out now and the buffalo used to destroy the timber. They were here in immense numbers, a great deal more than we ever had of domestic cattle, by the hundreds of thousands, in fact millions. The buffalo and the fires destroyed the timber. The timber here has only grown up in recent years. On our townsite here ten years ago you couldn't hardly see any trees, and now you see a great many, but they are young and of recent growth—cottonwoods, of

1239 course. I can hardly make any average of the timber here now as compared with that of former years. I can only say there is a greater quantity here than there was then. I can say four times as much with safety. When I speak of the timber I include the underbrush in the river bottoms, near the sides of the river. All that underbrush will become trees in a few years, because the cottonwood has a very rapid growth.

Redirect examination.

By Mr. ASHBAUGH:

1240 Where counsel refers to this water beneath the first and second bottoms as ground water I call it an underflow, and

that is about the term that has been generally applied to it. The lands along the first bottoms were located by regular settlers soon after the railroad got here in 1872. I mean the Atchison, Topeka and Santa Fe railroad. The railroad runs up pretty nearly to the river between Newton and Dodge, with some few exceptions, and between Newton and the State line the Santa Fe runs close
1241 along the north bank of the Arkansas river. They followed the river because it was level and the engineering was better. The railroad practically follows the old Santa Fe trail.

1243 The soldiers' home is located five miles east of here, directly on the banks of the Arkansas river. There are two hundred and sixty acres of land contained in the soldiers' home, and the northwest quarter of section 3, 27–24, and some adjoining lots. It has been in the possession of the State of Kansas since 1889. Formerly it was occupied as a United States military post, as the United States military post of Fort Dodge. Those premises are well improved. There is a large garden there and the balance of the ground is in alfalfa and natural grass. About fifty acres of it is farmed and cropped. Nearly all of these premises are in the first and second bottoms.

1244 When the South Side ditch was first dug it seemed to have a very abundant supply of water. Its source of supply was the underflow. It was some two or three years after they dug it that they connected it with the Arkansas river. During the first two or three years there was more in it than at any times afterwards, with the exception of the overflow that destroyed the ditch. The underflow didn't seem sufficient to supply their wants of water, and the proprietors conceived the idea that they would dig a small outlet to the river to let in more water. It was in a bend of the river where the head-gate was or where the supply of water rushed in. There came a tremendous freshet, and the bank being broken, the water found its way and just swept that whole ditch out, and then afterwards it destroyed the ditch, but they received a supply of water for several years afterwards, but it finally got less and less until it dwindled away entirely. The cause of its dwindling away
1245 entirely was for want of water. The outlet from this ditch emptied into the Arkansas river. For the first two or three years I should think there was three feet of water, and perhaps it was twelve to fourteen feet wide at the bottom, with a pretty strong current. It ran down the ditch and along parallel with the Arkansas river as the ditch was constructed. I have not been over there for a long time, but I think it is pretty well dried up.

The Eureka ditch is also known as the Soule ditch, and
1246 now is entirely dry. It has been dry for ten or twelve years. The cause of this is lack of water from the river.

I spoke about certain places of the underflow being higher than the river. I should say the nearest point to the river. For instance, you dig a well say two hundred yards north of the river, where the river is running almost directly east and west, as it does

here, and you will almost invariably find that the water in that well will be higher than the river at the nearest point right directly south back to the river, but it wouldn't be if you went up the
1247 river high enough. (Objection.) I couldn't state how far up the river you would have to go until it got on an absolute level. The fall of the river is seven feet to the mile here. During the first twenty-five years, from my experience I should say that the hay crop was more than twice as great as it is now. I have cut hay, and not five or ten or twenty acres of it, but hundreds of acres of it, right across the bridge here along the Arkansas river, four, five and six feet high, good bottom hay, and it has not grown
1248 there that tall for a good many years—at least for ten years.

I have seen fish in the river, but not for a good many years, except lately in holes along when the river was dry. We used to catch them with our trout lines, very large, nice channel cats. (Objection.) I have not known of any fish being caught with lines for several years, I suppose because they haven't been
1249 there. There has been water enough at flood times for fish. (Objection.) During the first years the stream was a running stream to such an extent that fish could live in it and be supplied with water. (Objection.) The stream used to run continuously and give them a chance to run off.

During those early years there was ice cut in the river most invariably, in fact all of our ice was cut that we used. That is not true now.

I knew of them floating railroad ties in the river about 1872 or 1873, or 1874 perhaps. When they were constructing their lines west of here they floated most of their ties down from the mounains, for the Santa Fe road.

The population of Dodge City is about twenty-five hundred or three thousand.

Recross-examination.

By Mr. HAYT:

1250 The land down at the soldiers' home is practicaly all under cultivation. I have visited it within the last two or three years. They are raising fine crops down there—pretty good gardens. I call the alfalfa there pretty good. I don't know whether the yield is an extraordinarily good one or not this year. It looks fine. I go by ther eevery two or three days. There is a good,
1251 strong stand of alfalfa there. I think it has been cut twice this season, and a third crop is now grown. I can't state the yield per acre. I have fifty acres in crop down there at my place. It is badly burned this year. It is on the second bottom, between the wagon road and the first bottom. There has been plenty of water in the river this summer, more than ordinarily. I think
1252 it has been running all summer. This crop was burned from the lack of rain at the proper time.

This ditch on the south side I suppose is a quarter of a mile from the river at the farthest head. The lands are quite low between the river and the ditch, and the ditch was dug to quite a depth below the surface of the water in the river—to quite a depth below the bottom of the river. I expect it was nearly five or six
1253 feet below. The soil there near the head of this ditch is simply the made bottom land, the same as it is along here,—made by the river. The ditch was located at that point to get the underflow. It runs close to the river for ten or fifteen miles. The water ran down this ditch the first year or two, I expect for twenty miles—possibly farther. There was enough for the purposes
1254 of irrigation, and it was so used at the time. The ditch was built to drain that country. It ran until the ditch was destroyed by the flood, and then it ran for two years afterwards. But it was less and less. That was from the seepage. The river
1255 washed the ditch out and it caved in. It washed in more than it washed out holes. I don't think the river channel has changed more up there than in other places along the river. This is a river of shifting sands and changing channels, but it has not changed materially up there.

The Soule ditch is filled upland destroyed, and wagon roads at various places have been been built across it by filling it in. I expect there is water enough in the river now and that there has been enough for a month or two to run that ditch if the ditch had
1256 been open for it,—enough to practically fill the ditch.

As to the hay crop, there was some decrease in it from the time I first saw it in the '60's, down to 1880. I have noticed a great falling off, more in the last ten years than previously, because I have had a good deal of hay ground myself, and it has got so absolutely worthless now I have to plough it up and put it in something else. It doesn't pay to cut half a ton or three-quarters of a ton where we used to get two or three tons. I noticed a slight decrease prior to 1880. Possibly that may be a feature of all hay lands that have been cropped for a number of years.

1257 I have spoken of the floating of ties down the river in 1872 and 1873. After the railroad was built there was no further occasion for floating ties down, and since that ties have been used in limited quantities only, and transported by the railroad. At flood times there is always water enough still to float ties down, if there were tires to be floated.

Cross-examination.

By Mr. CAMPBELL:

The soldiers' home is conducted under State auspices.

1258 I don't know of any institution on the line of the Arkansas river in Kansas conducted by the Government of the United States.

I did not mean to say that one of the ditches I spoke of was a

drainage ditch. It was constructed for irrigation purposes. But the water to supply the ditch was drained from this bottom, to take what substance there was out of it from the underflow. I
1259 think the Eureka ditch was begun prior to 1889. It was two or three years in building. The water was turned in the first year before it was completed, and then for one or two years afterwards. The Eureka ditch heads in Gray county, seven miles above the county seat, at a point called Ingalls. The ditch on the south side was begun in 1887 or 1888, to the best of my recollection. It was finished about a year after that. The ditch is about twenty five miles long about half the size of the Eureka ditch.

Redirect examination.

By Mr. ASHBAUGH:

1260 In answer to a question by counsel concerning the decreased flow of the river during the '70's, I don't think there was any permanent decrease during the '70's or early '80's.

1262 C. M. BEESON, Dodge City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Dodge City, Ford county, Kansas, since November, 1875. My business is farming and cattle raising. My cattle business has been conducted in and around Dodge City within a radius of a hundred miles. I have been acquainted with the Arkansas river and Arkansas valley through Ford county and other adjoining counties, and somewhat acquainted with it up to the mountains. I should say the average width of the Arkansas valley through Ford county was three or four miles, from bluffs to
1263 bluffs. It gets narrower as you go up the river. There are places, at Garden City, for instance, that it extends still wider, and there are places in Gray county that are very much wider. It has been wider in both Gray and Finney counties than in Ford county. Naturally the crops grow upon the bottom lands without irrigation. We strike the sage brush country close to the State line. In some places near the State line the sage brush comes down
1264 almost to the river. It varies. Through Edwards county the valley would average six or eight miles in width. During the first fifteen years that I knew the river I should judge that the average flow of the river, excluding floods and freshets, would be about three or four feet across the bottom, on the average. During the last ten or twelve years, excluding the year 1904, I think it has fallen off one-half. There are seasons now when the river is practically dry. Most of the year, practically speaking, the river is dry. There might be pools or holes standing along, but it wouldn't

be running enough to call it a running river, more or less
1265 half or two-thirds of the time in some years. The flow off the river has narrowed during the last fifteen years. I don't think it is more than a quarter as wide as it was twenty-five years ago. I don't think the river has narrowed so much, as to the banks. I am acquainted with what is called the underflow in this country. It is the water travelling under the ground—under the sand. It would seem like a sheet of water under the sand that you can dig down to and strike very easily. It extends back quite a distance, in a small way for a mile or two miles, very perceptibly. I think it flows back to the foot hills and bluffs very perceptibly. I think it flows more to the south than it does to the north. It goes in a southeasterly direction. It seems to bear more east, of course, but it inclines to flow south, and in comparison with the general direction off the
1266 river is parallel with the river. I have noticed it in digging for water, digging wells, and in one case particularly in 1884 I was interested in the building of a brick block here in Dodge City and at that time the underflow was so strong and effective that we placed water closets in the basement of our buildings. We dug down to the quicksand and used it for years successfully in washing off the offal. It carried it off; and of late years we couldn't do it at all. The reason is the water is sunk away. There is no water there. It would stand up two or three feet in that cesspool when we first built it. It is down here in the building. It is there to-day. I have not examined it for the last few years, since we got the water-works in here. But before that time it worked successfully. It has been ten or twelve years since the water-works were put in. I notice in my wells on the south side of the river that the water is two or three feet lower than it was eighteen years ago—at least three feet lower. The
1267 underflow has been receding. I think it is very perceptible in the rise and fall of the river that the underflow rises and falls with the rise and fall of the river. (Objection.) I have got personal observation as to that. I have a water hole back just a mile and a half south of here in a pasture. When the river is up I can always have plenty of water for my stock. As soon as the river goes down that water recedes and I have got no water. I think I can state by looking at the water hole without seeing the river the condition of the river, to a certain extent. (Objection.) Not wholly, but to an extent I can tell the condition of the river without seeing it.

The crops raised in the bottom lands are limited. Some small patches of wheat, and I have raised good corn on the bottoms here in the early days, some fifteen years ago, but of late years it is in alfalfa most exclusively. Other crops raised are cane and
1268 kaffir corn. There is quite a good deal of natural hay. During the last fifteen years as compared with the first fifteen years that I knew the valley the hay crop has fallen off very perceptibly. It has fallen off one-third to one-half. The alfalfa crops

close to the river are much better than they used to be, but back from the river they are not so good. The amount of land right next to the river that might be better is a limited amount. It depends upon the lay of the land. From eighty to a hundred rods on the first bottom they are better and will grow alfalfa now better than they would a few years ago. My opinion is that this is on account of the water receding and falling away below and giving the roots more distance before striking living water. During the early years
the water level on these bottom lands near the river would
1269 be within a foot or two feet of the surface. The best alfalfa land now in this valley I consider right up to the river banks. Back from the river it is not as good. It is second valley. I don't know what to attribute it to that it is not so good back from the river more than to the fall of the underflow. That is my belief of it. The only known cause I can give is the fall of the water. This is based upon my experience and observation in this valley. (Objection.) The amount of land that is comparatively better for alfalfa now than formerly I should say was about one-fifth or
1270 one-fourth. (Objection.) The yield per acre has fallen off about one-fourth, but there is a greater acreage now.

Q. Well, I am speaking not of the number of acres but as to the same acreage under similar conditions, or yield per acre, for instance.

A. It has fallen off about in proportion—about one-fourth.

Q. In proportion to what?

A. In proportion to the number of acres that it has benefitted. It has benefitted about one fourth and fell off about one-fourth in the matter of crop, I should judge.

Then about one-fifth of the land right near the river has been benefitted and about four-fifths of it has been injured, and the average crop, estimated on yield per acre, has fallen off I should think one-fourth. (Objection.) I have had alfalfa for about twelve or fifteen years. I have now about twelve hundred acres in alfalfa. This has been an exceptionally good year for alfalfa.

1271 I should judge about ten years ago we commenced remarking about the scarcity of water in the river. It is my opinion that the falling off of the water in the river is caused by the ditches above. (Objection.)

As to what is known in this country as the June rise, that is what we consider the melting of the snows in the mountains, that we are apt to get a rise without any rain during the summer some time if they have any amount of snow in the mountains. During the first fifteen or twenty years I was here the June rise would last up to along about the first of August, on an average. It would
1272 generally come along about the first of June. It would last probably a couple of months. During the last ten or twelve years there has been a scarcity of water. The floods recede much faster than they used to. In the last six or eight or ten years we have noticed that the rise in the river wouldn't last as

long as it used to in the early days. This has had its effect in making everything short, in the percentage I have given, in the shortage of crops, grasses, etc.

There was a great amount of hay put up in the early days here. The Government had lots of hay put up under Government contracts through the valley here for miles in the early days. This hay crop has fallen off to the extent of one-half, I think. I
1273 couldn't say that this falling off has been noticed in other crops except hay and alfalfa. We raise also cane and kaffir corn.

I was acquainted with the ditch dug on the south side of the river. The head of the ditch was nine miles above the city. The ditch was two and a half miles from the river, I think, at the farthest point, and at the nearest point about eighty rods. It was about eighteen or twenty miles long to where they cut it back to flow into the river. It was dug for irrigation purposes. I think it was sixteen feet wide on the top and probably eight or ten
1274 feet at the bottom and five or six feet deep. It got its supply of water out of the underflow. It didn't go down the ditch to amount to anything at all. After the dam broke and let the water into the ditch it never came down the ditch after that. I think that ditch was dug in 1889 or 1890. They ran a dam out in the river to catch the surface water and throw it into the ditch, then they dug the ditch to this cut from where they started the ditch proper. They dug it probably eighty or a hundred rods to the river, and in constructing the dam they didn't get it strong enough and the first rise that came broke that dam and let the water in and filled that ditch up with sand. It washed the sand from the river into the ditch and filled it up for probably a mile and a half. There was quite a current to the water in the ditch. It travelled right along. In some places where they hadn't dug it level it would be ripples. It would run the same as the river. That was true
1275 when its sole source was from the underflow. They dug an immense wide ditch, probably a hundred feet wide at the source and eight or ten feet deep, with dredges. They had an immense reservoir there. When they got down six or eight feet they struck continuous water—gravel, sand and water. This reservoir was probably thirty feet wide and six feet deep. The reservoir is there yet.

In reference to the current of the underflow, I have noticed in digging a water hole in my pasture about a mile and a half from the river that the water flowed with the river. It would get clear—in driving there with the teams and scrapers the upper side of the water would be clear while the lower side would be mucky and dirty. I mean by the "upper side" the west side. It seemed to have a natural flow with the river. (Objection.)

Recross-examination.

By Mr. DAWSON:

1276 From 1875 to 1882 my residence was in town. During those years I was not engaged in farming or in any other pursuit of that character. In 1878 I went into the cattle business, but I still continued in the saloon business until 1882. I lived in Pueblo, Colorado, from 1871 to 1874. I was also engaged in the saloon business in West Las Animas. In Pueblo I was in the saloon business and also was a musician. I have been as far

1277 up the river as Canyon City. I have been up the river as far as Buena Vista or Salida, but not as far as Leadville. I know from my own knowledge that above Canyon City there is practically no land that is farmed and irrigated, or at least that it is very limited in extent. During the last ten years I have not been up to Pueblo more than twice—once in August and once in May, I think. I think August is one of the months in which the Arkansas river is generally low, and May is one of the months when the waters are beginning to rise. That is generally the case. At Pueblo it

1278 looked like a lesser river in 1890 than it did in the '70's. But they had straighted the channel there through Pueblo and after that the river ran more rapidly. It looked more like a creek than in the early days.

When I speak of the valley here in this county as being

1279 three or four miles wide I include the second as well as the first bottom. The second bottom I should think is about eight or ten feet above the first bottom.

When I first entered this country you would naturally not go far for water if you were just going to take and dig water for use at once. If you wanted to dig a permanent well in the early days—there were very few wells dug that way—you could go and strike water any place at two or three feet, or get it without digging. There was always running water in the draws in the bottoms. During the last ten years I think you would have to go from four to six feet in the first bottom to strike water. I should think the elevation would be about six or eight feet above the bed of the river. That was at a point where you could strike water at two or three feet in the early days. I have never taken occasion to run any levels to find out whether the water as you go back from the river

1280 rises to a higher level than at the river. I have heard the testimony of the witness to-day that you could find water at a higher level than it showed in the river, but I don't know whether that is true or not. I never have tested that. In my best judgment water should be twelve to fifteen feet under the surface to make the most suitable condition for growing alfalfa—about twelve feet. I have seen alfalfa grown in Colorado under irrigation. I am speaking from observation and experience here. The alfalfa crop is not as good as it was six or eight years ago. I dont't think it is.

That applies to part of the land. Some of it is better. The
1281 wheat crops of late years have been on the increase in both acreage and yield up to this year. This year there has been quite a falling off in wheat. I think the unfavorable conditions this year are due largely to unfavorable conditions last winter. If we get a good fall and winter we can get along and have a fairly big crop. I think we have had more water this year than usual of late years. Last fall and winter we didn't have favorable conditions for the wheat of this season. I think the river has fallen off about two feet in the last ten or twelve years. I think
1282 it has fallen off three or four feet in the last twenty years. Well, I think it has fallen off at least three feet in the last twenty years. I first noticed a perceptibly diminished flow ten or twelve years ago. I think it fell off about a foot and a half
1283 between 1884 and 1894, and I should judge about the same amount from 1894 to 1904. I have crossed the river on an average three or four times a day. I attribute the falling away of the underflow and the falling off of water in the river to the taking out of the surface water in ditches between here and Pueblo. That is my understanding from reading and observation. I think some considerable ditches have been taken out in Colorado since 1894. I have been up the railroad several times and saw the construction. I might say that I have been active in the agitation in Kansas against Colorado taking out water in ditches. This was in my official capacity as a member of the legislature. I was on the ways and means committee and was a strong advocate of prosecuting this case. I was in the legislature one term—the last term. I have also been sheriff of this county. I was elected to the legislature two years ago
1285 this fall. There was never any contest in the house itself over the proposition to bring this suit. It was settled in the committee. There was no committee contest, but there was some opposition to the bill, but never of a heated kind, not to any extent. The objection was from the eastern part of the State. That is my recollection.

In speaking of the movement of the underflow in my examination in chief I meant that the water north of the river seemed to flow towards the river; that if it was south it seemed to flow from it more. It seemed to be a southeasterly direction and was not flowing
1286 towards the river so much. That was my observation from my water hole that I dug over in the pasture. I wouldn't say that the water on the north side of the river was moving south toward the river and east with the river both, but I think it is deeper to the underflow on the north side of the river than it is on the south side. My observation on the north side was not as thorough as on the south side. I can't say from my observation whether the water which is under the ground has any perceptible flow in any direction, that is, the water on the north side. It is just from my knowledge of the draws that run around that seem to flow toward the river on

this side, and on the south side they seem to be drawn to the
1287 foot-hills more. If you start back five miles from the river on the south side you would find the fall of the river to be toward the river, or north, and with the river, or east. It would go both ways.

The water holes that I sank on the south side were about a mile and a half back from the river. They were in a kind of basin, right on the bottom. That was the easiest place to get water—the lowest place. In its course the basin finally gets around into the river again. I think it heads toward the river. The basin don't show any signs of ever having been a part of the river chan-
1288 nel. I dug down there and struck the water. Whether it was an underflow, you could term it as you please, it had a current to the east, and that current was going in the direction of the slough in which the hole was dug, and of the water in the slough, when there was surface water running in it. It was most assuredly going down hill. I came pretty close to running levels to find out the elevation. The Santa Fe road made a survey
1289 in there within two hundred yards of that water hole. I was not working with the road. Their surveyor ran a line that came within fifty steps of my house, and it crossed the road about two hundred yards from this water hole, and he just remarked that there was only about half an inch difference on the rails at the Santa Fe depot. We were about half an inch higher at the water hole. I thought we were two or three feet higher. This water hole was in the northwest quarter of section 2, 25–27. I have three other water holes where there is no break or draw or ravine. We went about five or six feet there for water. I noticed a flow or
1290 current in all the wells. I noticed in the upper side of the hole the water cleared off first. Being perceptibly clear on the west side, we thought it was fed from the spring. The current was very slow; enough to clear it, though. We have to go deeper every year and clean those holes out deeper. It would probably take several hours to clear, maybe three or four hours. There would be a hole as big as this room, of water, probably. The nature or character of the country lying back of and above these holes
1291 is sandy. It is used for pasture and was so used when I first settled there. I fenced it about eighteen or twenty years ago.

Q. Is it not true, Mr. Beeson, that this underflow as a matter of fact comes in from the higher ground or bluffs and flows with the river and toward the river as a general rule?

A. I think it certainly does come from the higher points. I think it comes from the west, although I don't know. I am not versed on that.

1292 The sand hills are higher to the south back of us, and all the rain that falls on these hills comes from the south to the north and east toward the river. The springs can't get into those two east holes I spoke of because I piled the dirt all around them.

There are three water holes on the place. The first hole lies in a ravine or draw. Surface water can run in that hole, but these other two holes that surface water can't run in there except what falls in a funnel-shape hole.

I have been growing alfalfa in this vicinity some ten years. I think the underflow had commenced to diminish before I began to plant alfalfa. I will not concede that alfalfa will do better where waters are receding from the ground. Alfalfa is one of the best crops that is raised here, and there has been more and more land in this county put into alfalfa each year for the last five or six years. Lands have been given up for other crops and co-verted into alfalfa fields for several years past, and on the other hand they have turned the other way too, but the alfalfa crop has been increasing from year to year, but I will not say at the expense of the other crops. Each year there is more and more ground taken out of other crops on this first bottom through this county and put into alfalfa,
1293 but there has been more land put into alfalfa from the sod than there has been from old land, a good deal. I have seen the alfalfa that is grown down here on the land belonging to the soldiers' home, and they are raising good alfalfa there now I think. That alfalfa is on the Arkansas river bottom, and that bottom has been in alfalfa not over three years, if that long. I think about three years. It always gets better as it gets older here for four or five years, and then I think it begins to get worse. It is the best four or five years after you get a good stand.

Q. Is not that part of the reason that accounts for the alfalfa crop not being as good on a large number of these lands where you say it has fallen off, that it has been in too long?

A. Well, I don't know that it is. I don't think that that—the alfalfa is not long lived here; that is, we haven't been sowing much alfalfa until the last six or eight years. It has been raised here for twenty years, but only in very limited acreage.

The seed of alfalfa is a very profitable crop. I think they sow the seed again quite often.

1294 The cesspool I spoke of over here in a building we used as an ordinary cesspool to carry off the offal of the building. In 1886 or 1887 when they put in the water system then we connected up with it and discontinued the cesspool. There is no water in the cesspool at all. In those days there was two or three feet of it. I think it is four or five years since we examined the cesspool. I am satisfied that there is no water in it now. The sewer had nothing to drain it off, as it was not connected. I don't know whether it was a dry year or whether the year was dry or
1295 not the last time I looked at the cesspool. I don't know whether there has been any water in it since I looked at it four or five years ago.

I was here along in the late '80's. It is true that this country was then looked upon about Dodge City as unsuitable for farming, and that a large percentage of the population went away and gave it up

as a country in which they could not make a living at farming. Notwithstanding the fact that the river has fallen off since that time, it is a better farming country than it was then, I think. There are more people here engaged in farming, and those here are doing better and land is worth more and is gradually and steadily increasing ever since that time in price. When they put this ditch in on the south side of the river they excavated it near its
1296 head below the surface of the water in the river and even below the bed of the river, I think. I think they went down about five or six feet in depth and ran it along nearly parallel with the river some distance, about eighty rods from the river, I should judge. It was dug in river sand and gravel. I suppose the purpose was to have the water filter through from the river into this canal in order to conduct it off for irrigating purposes. It did that for a time and continued to do it until the river washed it out or filled it up, and then the river broke through over this dam and filled up this canal with mud and sediment so that after that the water wouldn't come into the ditch and make much of a flow. This dam was put in across the river to turn the surface flow of water into the ditch and they ran it up from its original head in the sand to connect it with the surface flow of the water. When the freshet broke down the dam it spoiled the ditch. They were not getting
1297 enough water out of the underflow here. I think for a year or two they irrigated quite a section. I don't know anything about the drainage of that river above the source of that ditch. I never went up there to examine it. I never heard the farmers say whether their bottoms dried off or whether their crops failed
1298 or anything about that. I am only speaking from the source down. The dam washed out at the time they completed this ditch and they never rebuilt it or cleaned out the ditch. You can sink a ditch below the surface of the water in the river and along close to the channel of the river almost any place and the water will come through the sand from the river, if you dig it close enough. I think it will. If you dig it close enough it will, I think. I don't think they could dig a ditch eighty rods from the river and have the water come in from the river as much as there was there. As to the water in the hole back three quarters of a mile, I think it came from the underflow. I don't think it seeped through from the river, that is, if it did, it did it in an angular course and not directly, and further up the river. It might have been a general underflow that was moving from the mountains on west across all these plains to get to the low country. It may be the case that there is a sheet of water extending all over this country very gradually moving from the mountains down toward the low country. It looks very reasonable that there is. I don't know that there is, but I am certain that there is an underflow along the river. That is something that we can investigate ourselves, but as to the general flow, I couldn't state.

in 1883. That was the old Dr. Collier ditch, which had its head-gate about six miles west of Syracuse in Hamilton county. There are some other ditches that I have not named in Hamilton county that are used for irrigation. There is the Tom Ford ditch, taken out east of Syracuse, on the north side of the river, and there
1792 is one on the south side. They were built in 1895 or 1896—some where along there. During the years from 1897 to 1903 I think these ditches didn't get a sufficient amount of water for the purposes of irrigation. The Frontier ditch is a private ditch built about ten years ago in the western part of Hamilton county, that comes in from Colorado. Its head-gate is about a mile
1793 and a half west of the State line, and it runs about six miles into Kansas. During the last five years they have had more water than any other ditch in the county. The big Collier ditch running above it sends a good deal of water down Horse creek and they get that water.

Cross-examination:

By Mr. DAWSON:

In 1887 I moved into Syracuse, but I only lived in town
1794 three years and then went back onto another farm. I stayed on that farm until five years ago. Since 1899 I have not been engaged in farming, only second hand. I have not operated the same place ever since I have been in the county. When I went back to the farm I went to another place. The place I now have I got in 1887. About 200 acres of it is in cultivation, and that is all on the first river bottom, on the north side of the river. It
1795 runs about one to four feet above the surface of the water in the river when the river is at an ordinary stage. It depends on the stage of the water. I have seen it when the river was clear out, and sometimes the river would overflow. I raised very little crops there without irrigation. My principal crops have been corn, wheat, oats, barley and alfalfa. The principal crops now are sorghum and kaffir corn. The alfalfa is all gone. I don't strike water now in digging post holes on this ground at the same
1796 depth I did in the early days. The water there is one and a half to two feet lower than it used to be. It would run from two and a half to six feet below the surface at this time. I didn't say that I attributed the falling off in my crops and the dying out of my alfalfa to the fact that the water had been lowered in this ground. I do attribute it to lack of irrigation, and grasshoppers. I don't think the lowering of the water in this ground has helped the alfalfa any. The best alfalfa ground we have in our county is about two to two and a half feet to water. I presume that our ground is about the same as that in Kearney county, though I am not personally acquainted with the
1797 latter. We have had less water in the soil and less water for irrigation, a great deal. There is no place upon this land

that I cultivated where I can't find water by going four to six feet in depth. There is plenty of it there, only it is a little farther down. There certainly is not as much, but then there is plenty of underflow, all right, if you go down after it. I determined the fact that this underflow had a current from west to east by digging a post hole one time. I saw it clear up from the west side towards the east. I was a quarter of a mile from the river, and went about
1798 two and a half feet deep before I struck the water. The top soil was gumbo, and then you struck gravel after a foot and a half of gumbo. It may have been in an old channel of the river. There might at some time have been a river there. I presume it was all river at some time. I don't know. The river shows evidences of its having shifted from year to year and from time to time, so that across the first bottom at any place you sink you might strike what at one time was an old channel of the river. I don't say that you could not. I don't think the gravel is any different there than where you go eight feet to water in the valley, after you get to it. I think the same strata of gravel is underlying all of the
1799 river bottom. The year that I made these tests or sank these posts holes so that I discovered the depth of the water below the surface, and this current, was probably 1888 or 1889, somewhere along there, when I first went on the farm. I have dug holes in the ground at different times and different places since then. I have a well at my place where the water don't stand as high by a foot and a half or two feet as it used to. When I dug that the ground was under irrigation and ever since has been under irrigation, and yet the water don't stand as high as formerly. When I first dug
1800 it it was about seven feet from the surface, and now it is about eight and a half to nine feet. Some of the ditches which supply water to my land run above this well on higher ground and the ground surrounding the well and lying adjacent to it is irrigated land. I have an orchard right south of it. I have been irrigating that land now for twelve years. And the ground had been irrigated two or three years when the well was dug and yet the water stands at a lower level in the soil than when I dug it. This well is located on section 11, 24–41. This well shows a variation from time to time as to the height of the water in it, and that variation is governed by the water in the river. I don't think it makes much difference whether I am running water in the ditches and irrigating the land or not. The water comes up within four feet of the top sometimes when the river is bank full, and at other times it stands seven or eight feet deep. The
1801 well is about one-third of a mile from the river. A big rise in the river will show in the well in about two to four days. It may show a little change from the irrigation of lands surrounding, but not much. The main ditch or Alamo ditch that runs across my farm runs in a way that would not have any effect on the well at all, because there is a draw between the ditch and my place where the house is. This draw is one that comes from the outlying

country, from the higher ground, and drains to the river. It
1802 never has water in it except in times of rain. There is no creek running through my place. This draw is 150 feet from the well, and the ground is lower than the well. The ground at the well is about eight feet above the bed of the river, I think, and the draw at its nearest point is probably about two feet lower than the ground at the well. Maybe a little more than that. I can't say positively. The top of the water in the well is lower than the ground in the draw. I think this draw would cut off the water from this ditch. It might not, but that would be my idea.
1803 It is true that if the water from the ditch was proceeding under ground it could easily pass this draw and strike the water in the well, to a certain extent. The water sometimes backs up into this draw from the river, but I never saw it show any rise from underneath. It came out of the bank of the draw when the river was high once. When the river is so high that it raises the water in my well within four feet of the surface, it backs up in this draw. It backs up to a lateral I have across the draw. That is as far as it will go. That is about one hundred and fifty to two
1804 hundred feet from the well. When the river rises then it backs the water up in this draw until there is no surface water in the draw within one hundred and fifty feet of the well. My idea is that the rise in the well comes from the underground flow and not from the water that the river backs up in the surface of this draw. The water has only backed up in the draw two or three times since I have lived there. I should say this draw is about four feet higher than the ordinary level of the water in my well.

This crop land which I have irrigated there has shown approxi-
mately one-half of a falling off. I pasture this land some in
1805 the winter. I don't pasture it very completely. Sometimes very little. When I was raising alfalfa there I generally put some calves on it after I put up the last crop in the fall and kept them there as long as it would furnish plenty of feed. I didn't find that had any tendency to trap out or kill the alfalfa. I think it did just as well. I had over a hundred acres in alfalfa there at one time; now I have none. I ploughed up the alfalfa last spring because there was very little there. I have been unable to get water for irrigation. I rely on the Occidental ditch, a private ditch,
1806 for irrigation. That was taken out in 1896, I think. During the time we took it out there was not ample water in the river to supply it at all times. We thought we could get better service, though, by owning a ditch than to buy our water.

I have known ever since I have been in that country of irrigation in Colorado and of the construction of ditches in that State, but I have never made any complaint nor lodged any objection in reference to the construction or operation of these Colorado ditches, except privately. I knew and realized from my own knowledge of the country in western Kansas the necessity for irrigation to make suc-

cessful crops, and I know that is true of eastern Colorado and also western Kansas. I think I saw that this litigation was contemplated, in the paper, when it first came out. I haven't taken any active interest in it personally. It has been discussed a good deal in
1807 my county. (Objection.) I never started any proceedings nor commenced any suits for the purpose of preventing Colorado from irrigating, and I have known of the fact that they were irrigating in Colorado and constructing large ditches since 1885 at the time I went there.

With water for irrigation upon our lands I think our lands are just as good to-day and would be just as productive as formerly. I think there are six ditches in our county, big and little. There is the Frontier ditch, and the Alamo ditch a year ago was a part of it, but it makes two ditches now. There is what we call the upper and lower Alamo, and the Occidental ditch and the two Ford
1808 ditches. Crops cannot be successfully raised in Hamilton county without irrigation. Farming lands in Hamilton county are not worth much without irrigation there any more than in Colorado. Our lands are not worth any more to-day than they were at any time in the last eight or ten years unless irrigated, except in boom time. I don't think they are worth as much. I think they are selling for less. The uplands and the lands not irrigated are worth more now than seven or eight years
1809 ago. The ditches that I have spoken about in our county are kept up pretty well, but not as well as they ought to have been. We started in to clean out the Occidental ditch in the spring of 1903, but didn't complete it altogether. There is or was a canal in that vicinity called the Alameda canal. It has washed out. The head-gate has washed out. I didn't mention it because they didn't use it for several years. About half a mile of the upper end of it is also washed out. If the ditches were attended to and we
1810 had more water for our ditches I think our crops would be all right. I don't know that I am taking the position that the Colorado ditches should be shut off for the mere purpose of allowing the water to go down the river. I don't think that Kansas is any better than Colorado or Colorado is any better than Kansas. (Objection.) I think it would be radically wrong, myself, to prevent every one taking water for irrigating purposes, compelling every one to leave the water in the river simply to run by to its mouth, and that would be a detriment and injury to western Kan-
1811 sas as well as Colorado. I think it is true that for the successful farming of this western part of Kansas, including the lands in our county, we must rely upon irrigation and are vitally interested in the maintaining of the right to irrigate. (Objection.) I have heard no talk or discussion among the population or citizens of our county which would indicate that they wished to do away with the doctrine of irrigation and have the water simply run by in the river. (Objection.) There is a better flow of water in the river this year, 1904, than for many years past.

1812 E. J. PYLE, Garden City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Garden City, Finney county, Kansas, for the last nineteen years and have been in the real estate business ever since I have been here. My business extends all over the county and I am familiar with the lands in adjoining counties both east and west. I am familiar with the flow of the Arkansas river and the crops raised in this county. I came here in 1885. The average flow of
1813 the river during the dry season of the year for the first five or ten years that I knew it I should think would be about two to two and a half feet deep on the average. The average flow of the river during the same season of the year for the last five or eight years, excluding the year 1904, I think would not be one foot. For the last few years the river has been dry most of the time. We now have flood waters most any time and then after that the river dries up. I don't know as I could tell any particular time, though we are most apt to have flood waters in June. After our flood waters have run out for the last five or eight years the river has been generally dry.

Examining Complainant's Exhibit A–45, I recognize it as a photograph of the bridge south on Main street across the Arkansas river. I don't know when the picture was taken, but I should think some time recently. If that picture was taken in April, 1904,
1814 it would be a correct view of the river. It does not show any water in it at all. The bridge is between a quarter and a half a mile long. I couldn't say just how long the river had been absolutely dry as shown in that picture. Every once in a while there is a flow of water comes down. I was in California part of the time between July, 1903, and May, 1904, though when here I didn't see any water in it. The crops that we raise in the valley through
1815 this county are mostly alfalfa. The Arkansas valley through this county is about three miles wide on the average—about four miles at the widest place and from a mile to two miles at the narrowest place. We distinguish between first and second bottom lands here. There is usually a rise of three or four feet between them. The depth to which we have to go for water on an average on the first bottom lands is owing to the water in the river. It is owing to how deep it is. The water percolates through the soil, and at times when the river is full of water there is a good deal of this first bottom land that is not over three or four feet to water. At other times it would probably be five or six feet. My judgment and experience is that the water saturates back under the first bottom lands and rises and falls with the rise and fall of the water in
1816 the river. This water is known as the underflow because it comes from the water stratum under the surface, and it is my

impression that it has a current. (Objection.) I couldn't say whether the water under the first bottom lands has a current or not. I don't know. It is the general and universal understanding here that the water beneath the bottom lands has a current.

(Complainant's Exhibit A–45 offered in evidence.)

The court house at Garden City is approximately half a mile from the river. The ground between the court house and the river,
a little more than half of it is on second bottom and the re-
1817 mainder on first bottom. The fair grounds lie between the
city and the river. The main part of it is on the first bottom, though it runs up a little on the second bottom. I remember the little lake or pond that used to be down on the south part of the fair grounds. It was about a mile long, though there is a part of it that leads out to the river. It runs back into the river, and it is about eighty feet wide at its widest part. It is longest east and west,
parallel with the river. The first years in which I knew this
1818 country and up until about 1888 it was full of water. After
about 1888 there has been very little water in it except at flood times. During the dry seasons I think it has gone dry a time or two. During the first years I knew it it was about five feet deep, deep enough for swimming purposes, and people did go swimming in it, and during the first years there were a great many fish in it, but I don't know how long they lasted, up to the years when it went dry. After that the fish were all killed out. It went dry so that the fish were killed out about 1888 or 1890, to the best of my recollection. It was four or five feet deep for something less than
half a mile long. This lake got its supply of water from the
1819 underflow. There was no inlet that I know of from the river.
There was no stream running into it at all. The water in that lake would fall and rise with the water in the river. The bottom of that lake is not entirely grassed over; it is some narrower than it used to be, but I don't think it has grassed over. There is an outlet to it or slough running from it across Main street, and it runs into the river about half a mile east of Main street. There is a bridge on Main street across this slough. There is some water in
it just at high water or flood periods.
1820 The lowering of the water in the river and under the first and
second bottoms has had a material effect upon the crops. They are not nearly so good as formerly. Upon the alfalfa, which is the main crop. As to prairie hay, it is owing to the flow of the river in the spring of the year as to the crop of wild hay. If we have a good flow of water in the river in the spring, that carries the wild hay through. I think the alfalfa crop has been injured by the falling of the water, fifty per cent. This falling off extends through the whole county and to that extent on an average.

Cross examination.

By Mr. ROGERS:

1821 My real estate business extends east and west along the Arkansas valley from Cimarron to Lakin. I have done business in Kearney county and some in Gray county. I have dealt as much in grazing and ranch lands as in agricultural lands. I distinguish grazing and ranch lands from agricultural lands, and by agricultural land mean land that is farmed and crops grown
1822 upon it. Grazing land or ranch land has increased in value. When I first came here it was in boom times and the land was high then. Without reference to that peculiar condition, however, during most of the years grazing and ranch lands have advanced at least one hundred per cent. During the dull times in 1893 and 1895 this upland could be bought at from fifty to a hundred dollars a quarter section. It is worth now about two hundred dollars a quarter anyhow. When I came here, leaving out of account the boom period, the improved bottom land or agricultural land was worth about twenty-five to fifty dollars an acre.
1823 That was from about 1887 or 1888 to 1890. I should say the price of this bottom land or the alfalfa land was from twenty-five to fifty dollars an acre, outside of the boom years. The land is now worth from fifteen to twenty dollars an acre. It has declined in value because it does not produce the crops of alfalfa that it did. A great deal has died out, and the tonnage is not so good. In speaking of agricultural lands, I refer to bottom lands. That is all I refer to. The lands I have been referring to have been under the ditch. The subject of making this land productive and fertile has been a subject of constant discussion. Garden City has been the center of the agitation looking towards the making of this
1824 part of the State valuable and the raising of crops. They have had frequent conventions here of farmers and others interested in the lands to discuss the methods for making lands along this river valuable. These meetings or conventions were matters of public notoriety and were advertised in the newspapers and also reported in the newspapers, and they were attended by people living along the river—by farmers as a
1825 rule. We have never struck upon any plan to make those lands valuable yet. We have tried everything and don't raise anything. I don't know how we are going to make them valuable unless we can get water. Taking the water from the river and other sources of supply to irrigate these lands has been the main theme since Garden City and its vicinity was first settled. We have talked about stock and crops and of crops grown on the uplands and
1826 all that sort of thing, but the main thing was irrigation. That meant taking water for irrigation from the Arkansas river. Of course we talked the underflow and pumping besides that. It was always getting water by some device, either from the river or from the underflow. We had a Government experiment

station here that experimented on different kinds of grain that would grow without irrigation on the uplands, but as to the bottom lands, it would take irrigation. I have heard it contended or insisted that the waters of the Arkansas river should be allowed to flow down the river as by nature they were intended to do. (Objection.) I have
heard it claimed by some that if the waters ran down the
1827 river we would have more rain. It would create a more humid atmosphere. We would have a great deal more rainfall. They have urged that it should flow down the river for that reason. I don't know that the owners of land here would prefer to have the water go down the river for that purpose rather than to take it out for the irrigation of crops, but I have heard that theory advanced. They prefer to have water to irrigate their land. (Objection.) I don't know of anyone insisting that water should not be taken out in Colorado for irrigation purposes simply to pass the
water by without being used for the irrigation of lands along
1828 the river in Kansas. (Objection.) I don't think that the waters of the Arkansas river have had any uniform flow for any considerable period of years. I think it had a uniform flow when I first saw the river. I was on the river in 1865, about 4 months—September, October, November and December. It had a uniform flow then. I crossed the plains at that time. With the exception of five or six years I have been on the river all the time
since 1865; that is, in the vicinity of the river. I came here
1829 from Wichita. For years I was acquainted with the river there, along about 1870. I can't give any series of years when the waters of the river had a uniform flow—not of late years. From the spring of 1885 to the spring of 1888, I think I can. I could only give an average. June would be the most uniform flow. That is the month of floods. Throughout the month it would be nearer the same. July would be the most apt to be uniform of any
month except June. Years ago it might have been uniform,
1830 but I couldn't say that it was. I don't say that they were uniform; I say they were most likely to be uniform. I refer to the years 1885 to 1888. Since that time we have had no regular flow to the water at all. There has nothing been uniform. I can't say that every day there was just as much water as any other day, but I say they were the nearest uniform in the month of June, at the time when the snows melt and come down the river—the flood waters. The flow is determined by conditions that change from day to day
and month to month.
1831 The picture of the bridge (Exhibit A–45) represents a condition in April of this year. It shows the river dry. With the exception of the two months I was in California, the picture shows practically the condition of the river from July of 1903 to April, 1904.

Whenever we can get water for irrigation here it is used. It is not used for any purpose except to irrigate crops. It runs in ditches sometimes when I don't see any use of it. It is running now and I

don't know of any crops that it is necessary to irrigate. I don't
1832 know why they are running it, but it is running. I have been in Colorado a number of times. I have been at Rocky Ford a number of times, and Denver, and Colorado Springs. I have seen irrigation as practiced about Rocky Ford, but I was not there in the winter time. I have seen people irrigate here in the winter time, but not extensively. The dryness of the river prior to April of this
year might be charged to the taking of water out by the
1833 ditches in Colorado for irrigation. The statement was a fact, so far as I knew it, that the river was dry here in April and that the water had been taken out in Colorado during that period. I don't know whether the dryness of the river in this last April was caused by the owners of canals in Colorado.

The lake or pond referred to in the direct examination may have been an old channel, but I think not, at least not within the knowledge of the oldest settlers here. The channel was about 80 feet wide at the widest place. The lake proper was between a quarter and a
half mile long, with a narrow outlet, or, taking it all to*to*gether,
1834 about a mile long. The water began to decline in this lake about 1888 or 1889. I think they began to sink wells around Garden City for the purpose of taking water from the underflow about 1890. They have been active in the business of sinking wells to get the underflow since that time. I should think there were about 300 wells around Garden City or in the valley tributary. I couldn't say how many acres of land are under cultivation in the neighborhood of Garden City. It might mean a mile and it might mean three or four miles. I should think somewhere between three
and four thousand acres, taking it from the river back to the
1835 bluff and for five miles east and west. A small percentage is irrigated by the use of wells, perhaps two or three acres by one well. Those three wells mentioned are within the territory I have named, about two miles by five. The water is pumped from these wells when the wind blows, and is usually stored in reservoirs until they are full and then turned onto the land. If not turned onto the land it will seep out within a short time. I don't know the effect that pumping from these windmills has upon the water
level underneath. It has possibly fallen some on that account,
1836 but not perceptibly. It has fallen some, but we think it is from the river and not from what little is pumped by the wells. The general fall in the valley I think has been two feet, but not from the wells. I don't charge anything, scarcely, to the wells. I don't think it has any effect, hardly, on the underflow. These wells are all between this so-called lake and the bluff lands. They will be north and east and west of that lake.

There is a ditch taken out of the river and covering a portion of this town and adjoining territory called the Garden City ditch.
It runs right through town and above the town about three
1837 miles. That ditch could water all the land that lies under it if there was enough water for the ditch. About 5,000 acres

could be watered from the ditch. There is a ditch running back of the one I have just spoken of, known as the Kansas canal. It is now called the Farmers canal. Its head-gate is about 11 miles above Garden City. This ditch is divided up out here about 5 miles. It is split up into smaller ditches called laterals. I couldn't say
1838 how long they are. Some of the land under that ditch has been cultivated by irrigation, and in this vicinity we have these two canals supplying water to the agricultural lands contiguous to Garden City.

Q. Referring to these two ditches you have just mentioned, do you understand it is the desire of the people owning lands under these ditches that they can cease to take out the water of the Arkansas river through these ditches for irrigation purposes?

A. No, sir.

Cross-examination continued.

By Mr. HAYT:

I came to Garden City in 1885. The main boom here was
1839 in 1885, 1886, and 1887. I don't know that it was advocated in those years that the rain belt extended westward. I never heard it mentioned in those days that the principal inducement for settlement in this country was the fact that the rain had increased in this locality. Yes, sir, the precipitation during the years 1884, 1885, and 1886, was very great. Those were wet years. I don't think 1887 was so good as 1885 and 1886. I was not here in 1884. During those three years the crops were raised from ordinary rainfall, then the crops decreased in quantity after the rainfall decreased, and the people then began to resort to irrigation for
1840 the raising of crops. They had irrigated on the bottom lands here before, but they resorted more generally to irrigation after that time. In the last two years the ditches have been cleaned out and more water used. Before that time the ownership was nonresident, but the home people have gotten hold of the ditches in the last few years and that is the cause of the revival. I don't know that it is any advantage to irrigate at this time, but some of them irrigate in the winter. I notice there is water running in the ditches now, but I don't know that anybody is using it. I have not
1841 been through this country in the last week or two and have not observed whether they are spreading the water on the land quite generally or not. I only saw the water running through the ditches here in town in the last few days. I have stated that I didn't think there was any perceptible effect upon the sheet of water by reason of the pumping of the wells. The irrigation pumps are five or six inches. The pumps are too small to have any effect on the underflow, in my judgment. Mrs. Richter's well is a different proposition. It pumps about a thousand gallons a minute. It is not in constant operation. I think it is seldom in operation. In dry times they use that well for irrigation upon the land that can

be irrigated from it, and whenever it is necessary to use water for irrigation that well is running. Yes, I know of another pumping plant that is being installed in this vicinity by Mr. Holcomb. I have been at that pumping plant, but have not been there for about 6 weeks. I don't know whether or not, as a matter of fact, they expect to have it in operation in about
1842 ten days, in time to use for the fall irrigation. I don't know whether that pumping plant has a capacity of about 6,000 gallons a minute. Yes, sir, I have talked with Mr. Holcomb and others with reference to the capacity of that plant, but he didn't know how much he had then when I talked with him. I have not talked with him lately. (Objection.) I have talked with him since the contract was made for this large pumping plant. It is now about completed. (Objection.) I don't remember that he stated the capacity of that plant. (Objection.) This pumping plant is
1843 located right at the junction of the first and second bottom lands. He proposes to get water for use from this plant just at the junction of the first and second bottoms, where there is quite a bench. He has a large well dug probably 15 feet by 30 feet, and in the *the* bottom of that he has what they call feeders—large pipes driven in the underflow, down perhaps 20 feet in the underflow. (Objection.) He also has galleries running out into the sands and gravel of an old river bed at that point. He had a ditch cut to the underflow leading the water into the main well from two directions. They were probably 100 feet long, each one of them. (Objection.)

These lands have not a fine growth of grass upon them at this time, for the reason that they are pastured off. All the land is in pasture between here and the river. There is a fine body of sod at this time. There might be three or four inches of thick grass on this land inside of the fair ground where it has not been pastured. I don't think there is considerable grass where they are pastur-
1844 ing it. I think it is pastured very short. I have not been there for the last two or three weeks.

No, sir, I dont' know of any point within four or five miles of where we are now where this water level is from ten to twelve feet above the level of the water in the river. Yes, sir, I know of a settlement out here north of town where they strike water in the wells, out here in the shallow water valley, where there is a man who claims that the water comes pretty near to the surface, but I don't know how much higher than the river, if any. The place referred to is located on section 2, 23-33. I have no means of knowing whether or not as a fact there are a number of wells in that vicinity where the water level is considerably higher than the water level of the river. I do know that the wells come near the surface,
1845 but I don't know how much higher they are than the river.

Q. Now, Mr. Pyle, has there not been considerable discussion here as to the cause of the water level in those wells being higher than the water level in the river, and have you not heard that discussion? (Objection.)

A. Yes, sir, I have heard it discussed, but the opinion is that the water out there doesn't come from the river. It comes from a northern source of supply—from the White Woman.

Q. You have heard it stated that the level at that place is much above the water level at the river, have you?

A. I don't know as I have heard that brought up before, as to whether it was higher than the river here, because the impression is that the water comes from the White Woman valley. That is a stream that has no outlet. It heads up in northwestern Kansas or in the edge of Colorado and runs about 75 miles southeasterly and has no outlet.

Q. Don't you know that that impression has been created by the fact that the water level is much higher than the water level in the river at its nearest point?

A. No.

1846 I never made any investigation myself in reference to that matter. I don't know of my own personal knowledge as to this water having an underflow. It was only a general impression.

We have talked those things over. I have never made any 1847 personal investigation to determine that question. I have never dug any wells. Yes, sir, I have stated that the alfalfa crop has been less of late years than formerly, and some of the people have been accustomed to pasturing the alfalfa after the last cutting, and that has been found to be an injury to the crop.

Cross-examination.

By Mr. CAMPBELL:

The distinction between the first and second bottoms is that there has been a little rise of about four feet between them. Usually the wild hay grows on the first bottom. The second bottoms are considered the best lands for agricultural purposes; that is, 1848 the second bottom that is cultivated by irrigation. As a rule we do not pretend to irrigate the first bottom.

I can not answer how many acres of land are being irrigated in this vicinity from the waters taken from the river. I don't know how extensively the irrigation is under the Amazon canal, which is one of the main canals, the Great Eastern or the Farmers' canal. It would have an injurious effect upon the lands already irrigated if the water were shut off from the Arkansas river and not allowed to run in the ditches, but I couldn't say to what extent, because they are in pretty bad condition now. We could not depend upon the land now under irrigation to raise crops if the water was shut off from the Arkansas river. We might raise a crop and we might not. There is considerable flood water coming down the stream which we don't make use of at all. I can form no estimate of how much land these flood waters would irrigate if they were impounded and kept from running down the main stream. If those flood waters could be reservoired and the water was used for irrigation purposes here

it would have a beneficial effect upon them. I cannot form any estimate of how much land these flood waters, if impounded, would reclaim from their now practically desert condition. I am
1849 familiar with the contour of this country around here to the Colorado line. I know of one place along the Arkansas river where a reservoir could be erected to catch these flood waters.
1850 It is out on the table land. There would be about 640 acres in this natural basin. I couldn't tell how much it would hold. If there are reservoir sites in Colorado that could utilize and impound the flood waters of the Arkansas river and we folks could get the benefit of these impounded waters, it might be of vast benefit to us here. Of course I think the more water that is stored, it makes a humid atmosphere.

Redirect examination.

By Mr. ASHBAUGH:

1851 The location of this reservoir site that I spoke of is about 7 miles northwest of Garden City. If there should be other places found between here and the Colorado line similar to it, and these waters should be impounded they could be used for irrigation between here and the Colorado line, and the more land we get irrigated the better we are off. The greater amount of water that could be stored and used would increase the productivenesss of this
1852 general country. I don't think that the amount of water pumped from these wells around here affects the underflow to any appreciable extent. We crossed the old Santa Fe trail to Fort Union, New Mexico, in 1865, loaded with Government freight for the fort. We struck the river at Great Bend and followed up the river to the Cimarron crossing. The Cimarron crossing is where the town of Cimarron is now and from which it derived its name. There was a good deal larger river then than now—a good deal deeper banks and a good deal more water. We were on the river that fall probably something near a month going and coming. This was in October, 1865.

1853 I. L. DIESEN, Garden City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Garden City and have lived here continuously since the spring of 1885. My home is two and a half miles south of Garden City and my business is farming and the cattle business and the ice business. I own some land here about two and a half miles south of the city, in the sand hills, and another piece adjoining the northwest corner of Garden City. I have been acquainted with the Arkansas river for 19 or 20 years. During the first two or three years

I was here it never was dry at any time. There was always
1854 some water in it, and during the dry season of the year I should judge the water was from a foot to a foot and a half deep. As to the flow during the dry season of the year for the last ten years, excluding the year 1904, I think it was perfectly dry about two or three months every year with the exception of one. During the present year there has been plenty of water until the last week or so. Yesterday, September 19, there was what I would term practically no water in the river. There was a little bit of seepage there, but it is what I should call dry.

Examining Complainant's Exhibit A–45, I recognize that as a picture of the Garden City bridge across the Arkansas river.
1855 Assuming that it was taken in the month of April, 1904, it was a fair representation of the river as it appeared yesterday when I examined it. For the last few years, excepting the year 1904, the river has been dry as shown in that picture from about five to eight months each year. It was dry after July 25, 1903, and from that on all fall and all last winter and until April or May, 1904. It was as dry as shown in that picture. I am acquainted with the location of the fair grounds in this city. They are on the first bottom lands. The first bottom lands at the fair ground are just about half a mile wide; then beyond the first bottom lands the second bottom lands are about two and a half miles wide, and the second bottoms are from three to five feet above the first bottoms. The fair grounds are located between the court house and the river and on the
1856 west side of main street. I remember the lake or pond that was right near the site of the fair grounds in former years. That lake was about 60 or 70 feet wide, and the length, possibly, all told, would be between one fourth and one third of a mile. In the early days it used to be three or four feet deep—deep enough for men to go swimming in it, and they did use to go swimming in it, and there used to be fish in it. I have not seen the lake for the last thirty days, but for the last five or ten years it has not had any water in it to speak of. The water that supplied that lake came from what were called springs at the upper end of the lake—seepage out of the ground. I should call it the underflow. The lake has no inlet and has no connection at all with the river. There is an outlet to it. It emptied back into the river about half a mile east of Main street. The bridge on the
1857 street south from the city is across that outlet. The cause for that lake going dry I expect was because no water comes in at the upper end. That would be my judgment. I think the lake didn't go dry before the river went dry. The water in that lake did rise and fall with the water in the river. There are some other lakes or ponds this side of Deerfield that I have seen as I have been passing along, but living far away from them, I never gave them close attention. They have pretty nearly the same characteristics as this one here. Whether they have gone dry or not I couldn't say. I haven't been up there lately. The underflow under the first

and second bottoms here and on each side has gone down in these later years. In 1885 I dug two wells on this land adjoining
1858 the city. It was 6 feet and 6 inches to water at that time. In the spring of 1889 I dug a large well for the purpose of pumping water for irrigation. It was about 7 feet 8 inches at that time. In 1892 I put down two more wells and the water at that time was a few inches less than ten feet deep. Two weeks ago I had that pump out getting it repaired, and I measured the water in the well and it lacked one inch of being 11 feet to water. All these wells were so located that by comparison of one with the other they show that the underflow has gone down the difference between these figures. The lowering of the underflow has had the effect that there are not as good crops produced in this valley land as there was in the earlier days. This condition of affairs extends up and down the valley through this county so far as I know.

Along about 1885 to 1891 there was water enough in the pond that I spoke of down here in the fair grounds so that we could cut ice on it in the winter. At that time we had reservoirs built just before it enters the river east of Main street and had ice houses there, and this stream furnished the water to fill those ice houses. They furnished ice for home consumption. There was not any winter between 1885 and about 1891 that we didn't get ice off from
1859 it. There has not been water in that enough for the last ten years to furnish ice in the winter. It might be that on the lake proper there would be some little time in the last ten years that you could cut ice, but not in the reservoirs. You could not on the lake within the last five years that I know of.

As to the ditches in this county, there is the Garden City ditch, and the one now called the Farmers ditch, and then farther west is the Amazon. The Amazon extends into the northwest part of this county. The Great Eastern is in Kearney county and extends down into Finney county. Some of the laterals reach within four miles of Garden City. The Garden City ditch is nearest the city of Garden City, and its head-gate is about five miles west of the
1860 Garden City ditch. The Garden City ditch is about 8 or 9 miles long. It was dug before my time in this country. My understanding has always been that it was dug in 1879 or 1880. At the present time it goes by the name of the Garden City Irrigation Association. It was in very good condition in 1885. The title of it when I came here was the Garden City Irrigating, Water Power and Manufacturing Company. The whole ditch was dug in 1885 when I came here, and there was water then running in it. I had water on my farm from it at any time I wanted it that whole season of 1885. In 1886 it was pretty much the same, but I think there was a little water in August of that year. 1887 was about similar to 1885. We had water the whole season, virtually. In 1888
1861 we had very little water after the summer rise or flood. In 1889 there was very little water. In 1890 about the same as
1889. Since 1890 it has been about the same thing right along.

Some years when there was a big lot of overflow water—floods—we had water for thirty or sixty days, and when there wasn't so much flood we didn't have so much water. I don't know that there was any perceptible difference in 1901, 1902, and 1903. At certain times during these recent years when this flood was on or whenever the summer waters came there was enough water to supply the needs of the farmers for irrigating purposes. After that water had run out the river was dry and the ditch was dry. There was another ditch near here
called the Kansas ditch, now called the Farmers ditch. I
1862 think it is sometimes called the Illinois ditch. I couldn't say
positively what the Kansas ditch was originally called. I think McCord and one of the Hudsons were interested in it. I think C. J. Jones and J. W. Wicks were interested in it. I should say that that ditch furnished water within a mile and a quarter of Garden City for irrigation purposes. That was all constructed before my time. Between the years 1885 and 1890 I know all the farms under it, as I gather them in my mind, were irrigated from that ditch. During the last five years prior to the year 1904 there was
not as much irrigating done, because they didn't have the
1863 water. That is also true of all the ditches in this county.
My understanding is that Mr. James Craig had something to do with the construction of the Garden City ditch as well as the Great Eastern.

The diminution of the water in this country and this county has reduced the crops in the river valley, especially on the hay bottoms, and it has caused the people who are growing orchards to irrigate them more than they did before to keep them growing. The loss of water for irrigation purposes upon the agricultural interests of the county has been very large. It has had a material effect. I expect it has decreased the acreage of cultivated lands in the county at least one third. The lands under these irrigating ditches have not been as productive during the last few years as they would have been if there had been as much water in the ditches as there was
the first five years that I knew them. I think the value of
1864 the land is not as great as it would have been if there had
been as much water, the value of the land being determined by its productiveness.

(Complainants Exhibits A–46, A–47, A–48, A–48½, A–49, and A–49½ introduced in evidence. Objection to all of the foregoing exhibits.)

1866 Cross-examination.

By Mr. HAYT:

What I would like to have is more water for irrigation. This would be to the benefit of this section of the State, in my judgment, and it is what all the people here want. I hope to get more water for irrigation as the result of this suit.

The first year I came here, in 1885, the rainfall through-
1867 out this country was not quite up to the average. In 1886 it was about the same as in 1885. There was quite a little bit more in 1887. In the fall of 1887 the water overflowed the fair grounds where that lake I have spoken of was located. There has been no river channel through there since I have lived here.
1868 There might have been such a channel years ago. In my judgment this whole bottom has been filled in here by wash brought down by the river at some time in the past years. This is a river of shifting sands more or less and changing channels at different places. Sometimes it runs on one side and sometimes on the other.

This lake or pond was fed by springs. I don't know positively the source of supply of those springs. There is higher ground
1869 on this side, but what experience I have had in digging wells half a mile and a mile north of that would not indicate to me that there would be any water higher. I don't know of any place about here where the water is on a higher level than the water in the river at this point. It may be true, yes, sir, that the general water level of the country follows to some extent the contour of the surface, but I don't think this is true in this valley. I think
1870 this underflow reaches out from the river on a level or nearly so. I have never made any investigation to determine whether the water level 15 or 20 miles away is higher than at the river. I only judge from what men tell me as to how deep the water is. If it should be found by investigation that the water level of the country 10 or 15 miles away from the river was higher than the water level of the river, I don't think that would change my opinion as to the source of supply of this water. As to the water that falls upon the drainage of the Arkansas river in the vicinity, the part that don't go into the ground I suppose goes into the river. That which goes into the ground I should think would go to supply the general water level of the country, provided there is any of it gets through far enough.

In June and July, 1902, there was plenty of water in the
1871 river for these ditches; that is, the first part of July. I don't know as it was the entire month. But none later in the fall. This year there has been quite considerable water in the river all the year up to the last fifteen or twenty days. In my opinion there has been enough to supply all of the ditches so far as they needed water.

I don't know that there is any perceptible difference in the
1872 value of land now from what it was in previous years. In the river valley lands are worth $35 an acre, and on the high lands probably twenty to forty dollars. I think these values have remained about stationary for the last ten or fifteen years. I would say they are as valuable at this time as they have been at any time in this history of the country.

Crops here were rather backward even up to the time the grass-

hoppers came, this year. This has been a rainy season and we have had plenty of water in the ditches. We have had considerable. I account for the crops being backward in this way: In the first place our rains came late, about the last week in April, and there was no water in the river until about that time or afterwards, and vegetation couldn't start, or didn't start, and about the time it got started then came the grasshoppers very badly. Alfalfa here is
1873 started both with and without irrigation. It is pretty difficult to start it without irrigation in the ordinary season. It has always stood the drought pretty well after it got started until this underflow went down. I should say it stands the drought better than any other crop. In my judgment the water should come with- three or four feet of the surface to get the best results in a crop of alfalfa. I know that the roots will go down twelve to fifteen feet to water, and sometimes make a good crop at that depth. It would possibly make a fair crop without much moisture on the surface. I can't say whether it is a common experience of those raising alfalfa in this vicinity and in the counties in Colorado adjoining that where the water level is 6 or 8 feet below the surface of the ground it is better for growing alfalfa than where the water
1874 comes within two or three feet of the surface of the ground. That is not my experience here. Possibly if the water level came nearer than three feet it would result in rotting the roots and destroying the crop. I have heard men that have had experience say that if the water level should stand at that depth from the surface for some length of time it would destroy the crop. I have some stock in the Garden City ditch, but am not an officer of the company. I raise crops both with and without irrigation.

Cross-examination.

By Mr. ROGERS:

1875 I have given a good deal of attention since I have lived in this country to the methods by which this country may be made prosperous. I have always understood this to be the arid region. I should say that the arid region commences about Kinsley, Kansas, and that from there on to the west it is a country in which crops can not be grown successfully without irrigation. The problem in this locality has been to get the water with which to irrigate these lands, and I understand it has been recognized in what I have designated as the arid part of Kansas that we had a right to take out the waters of the river as far as we could
1876 get waters and use them in the irrigation of these lands. I don't recall any instance of anybody disputing our right to take out water for irrigating purposes. (Objection.) The nature of this suit has been discussed more or less in this community. I expect that the bill filed by the State of Kansas against the State of Colorado purports to be on behalf of the owners of lands adjoining the Arkansas river in this

part of Kansas as well as in all other parts of Kansas. I
1879 should think, therefore, that the State represents me as well as all other land owners in this vicinity. I don't understand that this bill was brough- as a negative upon the right to take the water out for irrigation as against the right to have it continue unimpeded and unobstructed through the State of Kansas. (Objection.) If it is true that the object of the amended bill is to have the Supreme Court declare that all the waters of the Arkansas river shall flow through the State of Kansas without being taken
1880 out for irrigation, I would be in favor of it. (Objection.) If this river was flowing full of water or the average flow of water the underflow or the sheet water of this country would be anywhere from four to five feet high and this valley would be worth considerably more than it is today, instead of having a dry river.

1881 I was called as a witness before a Senate committee that came here to investigate conditions in western Kansas in 1889 when Senator Plumb was here, but I don't remember whether I testified or not. I don't think I did. I was present one afternoon at the hearing a little while.

I have studied irrigation and have been trying to get more water since the spring of 1889 when I commenced pumping water. In 1886 I first went to Colorado to the first water melon picnic
1882 at Rocky Ford. There were some few ditches up in that neighborhood then. I saw the Rocky Ford ditch, but I didn't notice the Catlin ditch. We knew they were building ditches in that part of Colorado. We were getting less water here, and they must have taken it out somewhere in ditches. That is what made me think of pumping water. It was in 1889 when we began to notice it. I suppose large sums of money were being invested in these enterprises but I have no way of knowing. I know of a few people who went from here and settled under those ditches,
1883 but not many. I don't think they were very successful at that time, but they have had better success since then. I guess there was considerable complaint at that time by people in this vicinity concerning the taking out of water in Colorado, but it was not made public. There was nobody to make it to. The ground on which it was made was simply because we were not getting any water here at all. They were taking it all. We couldn't get any water for our ditches, and that was the ground of our
1884 complaint. As to whether the people in western Kansas have endeavored as far as possible to follow the course marked out by the people of Colorado in respect to irrigation, I think the reverse is true. I think Colorado has been following us. Our ideas of irrigation were formed in advance of those of Colorado, I think, and this part of Kansas and Colorado have been proceeding along common lines. There is no doubt that they are mutually interested in irrigating their respective lands. The climatic condition of the lands west of Kinsley and of Colorado are very nearly the

same, and the lands are equally fertile and equally in need of water from somewhere.

There has been a good deal of mutual interest in developing this part of the United States. We have had irrigation conventions here in Garden City from time to time, and they have been attended by irrigators from Colorado and our people have gone to meetings in Colorado to discuss irrigating, and also to the irrigation con-
1885 gresses that have been held from time to time throughout the United States. So that as a matter of fact there is no doubt that Kansas west of Kinsley has been more in sympathy or more aligned with interests in Colorado in respect to its development than it has with that part of Kansas east of Kinsley, because they have practically the same conditions. My view is that whatever is for the interests of Colorado in respect to the diversion of
1886 water is for my interests, if you would give us half the water. (Objection.) I certainly would not have any cause for a contest if the men who have equally settled this valley here with the men in Colorado and put in their money got their share of the water for irrigation purposes.

I spoke of two wells in which the water was 6 feet 6 inches below the surface of the ground. One was dug in April and the other in September, 1885. I can give the months when I found the
1887 water at certain levels, I think. In 1889 that was either the last of March or the first of April when I dug the big well. In 1892 that was in the spring, either in April or May. In 1904 I merely measured the well. That was about two weeks ago, which would make it the first week in September. Those wells were at the same place on the farm here in section 7, 24–32 west, southwest quarter.

Cross-examination.

By Mr. CAMPBELL:

Yes, I have been thinking considerably about irrigation
1888 matters for the last few years. I began to study irrigation matters more in the winter of 1888 and 1889 than any other time, the reason being that we got very little water in the year 1888 out of the river to irrigate from, and I had started a young orchard and made up my mind I had to have some water, and that is the reason why I put down this well in the spring of 1889. I have been making a study of these matters more or less ever since. I would say that the arid region begins near Kinsley, which is east
1889 of here about 86 miles, I believe. I would say that there is possibly 75,000 to 100,000 acres of land irrigated in the State of Kansas in the Arkansas valley. Before this land was irrigated in some seasons it would produce a crop but we could not depend upon it to raise a crop without irrigation. If the people in this section of Kansas were prevented from taking the waters of the Arkan-

sas river for the purposes of irrigation the land referred to
1890 would probably go back to cattle and to raising rough forage crops. If the people along this river should now be deprived of the right to take waters to irrigate this 75,000 to 100,000 acres of land it would probably lessen the population some and the country would naturally go back. Probably it is so, that property
1891 has increased and population has increased by reason of the increase in irrigated lands. Considerable flood waters pass down the river that are not used for any purpose whatever, and if they were impounded in reservoirs in the State of Kansas, undoubtedly the waters that now go to waste could be used for the purpose of irrigating a a large body of land which is now arid and unproductive. There are probably some reservoir sites of small capacity in the State of Kansas between here and the Colorado line. There is no doubt that the more land we can irrigate from the waters of the Arkansas river the more population will come in and the more valuable our lands will become. I couldn't say whether the impounding of waters now going to waste would be of greater benefit to us than the preservation of the underflow.

1892 Redirect examination.

By Mr. ASHBAUGH:

I think the Arkansas river between its banks was about a thousand feet wide when we built the bridge in 1885, and my judgment is that the river between the banks today is about 850 feet wide, but it might be 960 feet wide.

1894 C. S. LONGSTRETH, Garden City, Kansas.

Direct examination.

By Mr. SMITH:

I live at Lakin, Kearney county, Kansas, and have lived there since 1884. I am farming and fruit growing, and have 240 acres of land. I went to Kearney county first in 1873, at which time I was connected with the Santa Fe Railroad Company, and was with the Santa Fe Railroad Company until about 1886. I was in the
1895 land department of the road and we were experimenting here and throughout this country as to whether anything could grow or anybody could live here and the road opened up experiment stations at different points and I was employed in that work. We gave a good deal of attention to forestry, and of course experimented with other things. I was one of the earliest settlers of Kearney county.

My land lies under the Western ditch. It takes water from the Arkansas river about 8 or 9 miles west of my place. The
1896 Western ditch is about 25 miles long. That ditch is all in the bottom. It goes out from the river and runs back to the

river again. It takes in the valley and the bottoms there. The Western ditch was started either in 1879 or 1880. It was then called the Minnehaha ditch. I became connected with it in 1880. The name was changed in 1881. I believe I operated that ditch myself and opened it all clear out through the whole length, I think, and then it was finished afterwards by other parties. I opened it through so that the water was running the whole length. We were using the water, and it was made some larger afterwards. I home-
1897 steaded land there that I live on now. I commenced irrigating from that ditch on my own land in the spring of 1885, I think. When we built that ditch in 1879 or 1880 I couldn't state what the average flow of the Arkansas river was at that point. There was an abundance of water, I know, flowing all the time. The river was never dry in those years. It was a running stream the year round. The supply of water in the ditch at that time was splendid; it was sufficient at all times at that time. I didn't notice any falling off in the supply of water there for some time afterwards, down to about 1886 or 1887, I think, somewhere along there. I noticed that there were periods we couldn't get a supply of water in the ditch. That would be along in the late summer or fall. I think the first time I ever saw the river dry was in September, 1886, or 1887. That decrease in the flow of the water in the river and in the ditch continued, and it has been growing less ever
1898 since that time. I think there was one season there we didn't get any water at all during the season. This was along in 1893 or 1894. We have done some irrigating every season. We generally have water there along the first of June. We very seldom get any water in, though, until about that time. But about the months of July, August, and September, we oftener didn't get any. Generally speaking, it is great chances if we get it. This season it has been a very steady flow. The fact is it has been a better season this season than it has been for a number of years. It is more regu-
lar. There is not half the water in the river now from about
1899 1892 to 1903 that there was in the river throughout the season at the time we built that ditch. In the growing season—July, August and September—as compared with the earlier years, it would be in about the same proportion, I should judge about fifty per cent. less than it was in those years. Prior to this year it has been dry most every year of late at some period of the season, generally through the late fall. In September and October it is dry and stays that way until it comes cold weather and then it will rise and the water will come in some, but there is not near the water running in the river as it used to. Then it is dry again in the spring along about the last of March and through April, and the first of May it is generally dry. Then the water comes in June, and then as a general thing the water will come down as heavy as ever. It will be just for a few days only; it will not last.

On my place we generally raise alfalfa and farm crops. I
1900 have considerable fruit on my place. I have about 70 acres in orchard. I think the first alfalfa I sowed there was in

1886, a year or two after I opened it up. I can raise alfalfa there successfully without irrigation, but can't raise a full crop. We can raise a good deal more with irrigation, but I can raise a very good crop there without irrigation. Whether the decrease in the flow of water in the ditch affected the productiveness of my lands depends a good deal upon the season. In some seasons it has caused total failures. Generally speaking, on the average the productiveness of my land has become affected by the decrease in the flow of water. The loss of water, not having it regularly, has affected the product-
iven-ss of my land I should say in a general way fifty per
1901 cent. There is no question about that. As to the times when we usually irrigate, that depends a little on circumstances. We are governed a good deal by the season. If the season is very dry we irrigate it most any time in the season. We irrigate it in the winter if it is very dry, but in the spring if we get rain for a long time we don't irrigate it until later along, whenever it needs it. We most generally make a practice of irrigating immediately after cutting the crop, and if we fail to get water at the season when it is needed for alfalfa it decreases it. This general effect that I have described as to my land exists among my neighbors as well. I don't think there is a great deal of difference in the amount of cultivated land under the ditch now as compared with what it was when the ditch was running full. Most crops that are raised there are forage crops, and of course there is alfalfa and sorghum and such feed as that raised for forage mostly. There has been a decrease of growing grain crops
and anything of that kind. There is nothing of that kind
1902 grown now compared with what it used to be. Last year, 1903, the flow of water was not nearly as regular nor as much as it has been this season. It has been more regular this year than it has been for three or four years anyway. We have had a more regular flow. I don't know as any more water ran down the river, but it has been more regular. As to the effect of the decrease upon the value of my land, it has affected the producing capacity of it, of
course. It has decreased it. That is generally true of land
1903 under the ditch along the bottom there. There is about twenty-four or twenty-five acres of land under that ditch that can be irrigated—that is subject to water from it—all of which has been affected more or less the same as mine. Don't understand that I have that much under cultivation. There is that much under the ditch that can be watered from it. The decrease in the flow in the ditch and my inability to irrigate has had an effect on my fruit crop. It has decreased its productiveness in the same way as with the alfalfa.

Cross-examination.

By Mr. DAWSON:

It was in 1886, I think, that I set the first orchard out at my place.
So far as my experience with orchards is concerned, I have
1904 been growing fruit for fifty years. There has been only one year, I think, when I failed to get water to irrigate the land

entirely, and that was either 1893 or 1894, as near as I can remember. I couldn't say that was — exceptionally dry year. I don't know. All I know is that there was no water in the river that year for irrigation purposes. It was not because the ditch was out of repair. I know that. I know the facilities for getting the water into the ditch were complete that year. We had at the head of this
Western ditch what you might call a permanent dam made
1905 of rock, and that is there yet. It extends across the river
now. At that time it didn't extend clear across. I think the year we didn't get any water there was no water going around the end of the dam. I should judge the dam is two or three feet high. I don't know how the back side of it is filled in. They have a waste-way at the head-gates that the sand washes and leaves the channel clear into the head-gate of the ditch. When the ditch closes down the water doesn't go over the dam, it goes through the waste-way going out into the river. The waste-way will not carry
all that the river sometimes carries. It carries it full, though,
1906 and leaves the channel clear at the head-gates when the river
goes down. When there is more water than goes into the head-gate or waste-way it simply runs over the top of the dam. It has to. We have not left any opening in the dam, I think. I don't know but what there are some openings washed in it. I didn't build the dam. It was in 1884 that I moved my family under that canal. At that time I was representing the Santa Fe Railway Company and of course I was on the ditch and worked there too. I had been representing them solely before I went there. I had been there as early as 1873. I was there on the river in 1874. I stated or intended to state that the first time I ever saw the river dry was in 1886 or 1887. I don't think I saw the Arkansas river in 1874 when it had practically no water in it. I think the river was about as full that season
as I ever saw it. It was out over the banks here all that fall, I
1907 know. I don't know that the year 1874 was one of the
driest years so far as the flow in the river was concerned that has ever been known on this river. I know right the opposite. If witnesses at Dodge City and Wichita and Kinsley testified that in 1874 the river was practically dry from Wichita to the Colorado State line they were mistaken. I saw the river in both 1876 and 1877. In neither of those years the river was practically dry here in Kansas anywhere from Dodge City west. There was ample water in the river at this point and from here west in those years. In 1880 there was plenty of water in the river at this point. So that up to 1886 or 1887 I had never seen the river dry
so that there was not flowing water in it at this point. My
1908 knowledge of the river covers a period from 1873 up to that
first time in 1886 or 1887. When I say I never saw the stream at any time of the year when there was not running water in it at this point and from here west, I saw it dry east of here, though. I saw it dry at Hutchinson. It was dry most every season up there along through the summer time. I couldn't testify any-

thing about the river beyond Hutchinson. I knew as much about the river at Hutchinson from 1873 up to 1880 as I did about this point. I was on the river during that period of time, and was there as much as here. I was employed on the road and my work carried me along the road clear from Hutchinson to the State line. I was going back and forth, so that I was familiar with all the river between Hutchinson and the Colorado State line. I think it is a fact that at Hutchinson, Kansas, during the period from 1873 on up to the present time, the river has been dry at various times during
the season in almost every year, or the majority of them. I
1909 know I very frequently found it dry there. I remember well
in 1878 anyway the river was dry at Hutchinson. I had occasion to cross it a number of times at that time. I drove across it. It was dry. It had not a particle of water in it. I think probably through August and September in 1874 the river was practically dry at Hutchinson and from there down. I couldn't be positive about that though, but that is my best recollection. 1874 was the grasshopper year. I couldn't say anything positively about the
condition of the river at Hutchinson. I know it was dry
1910 very often. There might have been water in it all of the
season in the year 1877. I couldn't say. As a general proposition, then, you would very often find the river dry some time during the summer season or early fall at Hutchinson and from Great Bend east. I used to notice that a great deal. It would run dry when there was always plenty of water running in the river here. At the same time that I would find the river dry at Hutchinson I would find water running in the river here at Garden City and up about Lakin. A good flow of water.

I believe I know where this bridge at Garden City is, but I am not right certain of that. I know it is right down here on Main street. I would find the river bed generally covered, I guess, here at Lakin, when I would find the river dry east. How deep, I couldn't say. It would generally be running, as a rule. Of course in some places it would deepen and run in a narrow channel and
in some places it would broaden out clear across. I believe
1911 the channel here where I would find it covered was anywhere
from eight hundred to a thousand feet wide. The water here would not be over a foot deep anyway, and I would not suppose it was running clear across. It would be a good flow of water. That would generally be through the months of August and September.

The 250 acres of land where I live is all under cultivation, a large proportion of it in alfalfa. I am on section 4, township 24–36. I raise the ordinary crops that have been described as common to this part of Kansas, and in addition to that I have somewhere about seventy acres of orchard. I just finished irrigating the orchard last
week for the last time. I have irrigated my orchard five times
1912 this summer. I know that will bring the best results. I
plough the orchard about once in three years. I work the ground all up once in three years. In running the water

through the orchard for irrigation I flood it. I run it in fresh ploughed ditches every season, perfectly clean. You couldn't run water any other way and do it successfully. I have no interest in this Western ditch now. I have no ditch in which I am personally interested as an owner, and I don't want any. I rent water from the Western ditch. I take water out of the ditch for only a
1913 part of my place. I just simply had water for the orchard part of this season. I take from season to season just as much water as I think I need and can get, and I don't irrigate all of my land every year. I can't be sure of crops in that section of Kansas without relying on irrigation from year to year, and so far as the value of farm lands in that country is concerned they most generally rely upon water for irrigation. The productiveness of my land has most certainly been affected by lack of water for irrigation. I have at all times taken from this ditch all the water I could get, when I needed it. This year I have not irrigated all of my land. While the ditch had an ample supply this year, I didn't know this spring that it was going to. I have got to know in advance whether
1914 I am going to have any certainty of it. The lack of productiveness of my land this year grew out of my not being sure of getting the water. I could have had the water if I had put all my land in this year, by taking chances on getting the water, but I was not sure of getting it. If I had known I would be sure of it I would have put it all in. For that reason I have lost the crops I could have put in if I had gotten the water. If I had put them in I would have gotten the water. There has been sufficient water this season, but last year there was not, and the year before, and there have been so many seasons we haven't had it that I didn't want to take those chances. For that reason, lack of water heretofore is the reason I didn't put it in.

I think the flow of the Arkansas river in my vicinity has fallen off a great deal of late years, about fifty per cent. or more, and that decrease also applies to the winter flow. I think the winter flow in the last eight or ten years is about fifty per cent. less than it
1915 was when I first knew it. I couldn't say that I have noticed any lessening in the flow of any other streams than the Arkansas river of late years. I have not had an opportunity to do that.

I have been up in Colorado along the Arkansas river probably a dozen times in twenty years; not more than that. As to what I attribute this falling off in the Arkansas river in late years to, I will say this, that I believe if we had as much timber in Colorado as we had twenty years ago we would have pretty nearly the same flow of water. I think it has a great deal to do with it. I think you are allowing your timber to be destroyed up there, and you are destroying yourselves. I lay it more to that than anything else.
1916 There is no water that I know of taken out of the Arkansas river for irrigation during the middle of the winter. There is very little anyway. And it is most assuredly true that the very

fact that the flow of the river in the winter has decreased in accordance with the flow in the summer indicates that something besides irrigation has affected it in part at least. I think it is the cutting off of the timber at the head waters of the Arkansas river and its tributaries that is largely responsible for that. That has been my opinion for years. You retimber the mountains there and you will have the flow of water increased. There is no question about that.

The June flow we have in the Arkansas river still comes down about the same in amount, but it does not last so long. That is another indication that something lets the water get away faster. And when you eat off all of the grass of the mountain country and trample up the brush and cut off the timber the snow in the spring soon goes off, and it goes off in a greater hurry and doesn't last so long.

This farm of mine is worth as much on the market to-day as it ever was except in boom times. I don't think anybody has money enough to buy it. It is there permanently. It is not for sale. It suits me all right. I should judge there is somewhere in the neighborhood of one hundred thousand acres under ditch in my county. I couldn't say positively. These lands under the ditch are certainly much more productive when they have ample irrigation than without it, and when they are properly irrigated they will certainly produce more and support a larger population than without irrigation.

There is a great deal of water which runs to waste in the flood waters of the Arkansas river. It is a river which many times during the season has a very large flow of water in it by reason of heavy rains and floods. If these waters could be stored they most certainly would be sufficient to bring under irrigation many thousands of acres of land that are now arid. There are along the drainage area of the Arkansas river in western Kansas many thousands of acres of unirrigated lands at this time which are suitable for irrigation. There are opportunities for the storage of this water by the construction of storage reservoirs within Kansas, almost natural reservoir sites. A few years ago I had an engineer that made a kind of preliminary survey or something of that kind between this and our place, between here and Lakin, and on the north side here, and I think here right north of Sherlock, about seven miles north of here, there could be a reservoir placed in there, and one or two others west of that, between here and there, that would make good reservoir sites, but what the capacity of them would be I don't know. I remember his saying at the time that one of them would hold a depth of water I think of probably fifty feet, covering somewhere near a quarter section of land, I think. I know that at the time I asked him the question as to how long that water would stay in there if it were put in. I thought it would evaporate. He said if it was once filled it would never go out. It was a deep reservoir. We have one good reservoir site right on the ditch, right on the bottom, that if once full of water would irrigate that whole valley

there in dry seasons. It is a small valley in there, twenty-five thousand acres, that I speak of, along that ditch. And that reservoir site would care for that valley—that twenty-five thousand acres,—throughout the dry season. Of course I wouldn't say it would be ample for it without any other water, but the water we generally get would be sufficient.

I have been interested in the subject of irrigation for some years, and I have made such efforts as I could to try and develop the State. I have pioneered in that line here in Kansas. I have taken some interest and kept track of the development of Colorado
1920 along that line. I have lodged no complaint and started no suit and filed no protests against Colorado developing her irrigation projects. This matter of irrigating the land has been discussed among the people of my county. Certainly they have an interest in having the lands irrigated, of course. It is our dependence there, you might say, that is, in an agricultural way. It has been under consideration and discussion by our people ever since the settlement of this country. The irrigated land itself has brought the settlement in along the river. For approximately twenty years that subject, I think, has been considered more or less by the people through this section.

I heard of this suit begun by the State of Kansas when it
1921 was first talked of, in the beginning. My understanding was that the State of Kansas claimed to be representing our citizens along the Arkansas river. (Objection.) I don't know what they would be representing if they didn't represent them. If this amended bill of complaint filed by the State of Kansas in this case seeks to establish a doctrine which would prevent all Coloradoans and also all citizens of Kansas from diverting water from the Arkansas river, that would not be to the advantage of myself and the citizens of my county. (Objection.)

1922 Q. I read from the amended bill of complaint filed by the complainant in this case:

"By reason of the prior settlement, occupation, and title of the inhabitants of the State of Kansas upon and to the lands situated in the valley of said river, including those upon the banks of said river, the State of Kansas and the owners of land in said valley did acquire and now have the right to the uninterrupted and unimpeded flow of all of the waters of said river into and across the State of Kansas."

I ask you if it would be to the advantage of yourself and the citizens of your county to have the waters of the Arkansas river flow into and through the State of Kansas as against the right to take those waters out for irrigation. (Objection.)

A. No, sir, I don't think it would be to our advantage to let the waters pass by us.

Recross-examination.

By Mr. CAMPBELL:

I mean by renting water that we pay so much a year for the water. You might say we purchase it. We call it renting
1923 it. We make leases or contracts for it. We pay so much a year for so much an acre. In other words, we contract with the owners of the ditch to furnish us a certain amount of water for the current year, and that is what I mean by renting the water.

Redirect examination.

By Mr. SMITH:

I have been in Colorado two or three times and have observed irrigation there during the winter seasons. I think the last time I was there was about eight or nine years ago. I know they were at that time using a great deal of water for irrigation from the Arkansas river in the winter. When I was there, at that time it was in the last of January. It was a warm spell of weather and the
1924 ditches were all running full of water all the way up.

For alfalfa and fruit both, and in fact for all crops, a thorough soaking of the ground in the winter season is the most important irrigation you can give it. Winter irrigation is now, with me, I know, regarded as a profitable thing when you can get the water.

I don't know that the June rises are larger now than they were formerly. I don't think I ever saw the river run any fuller than it did this spring, but it didn't last long. Last year it was just as high. I think along in the '90's we had those June rises come the same way. There don't seem to be any decrease in the rise of the water in the river in any of that period of time. Well, I don't know but what there has been an increase. I don't think I ever saw the river any higher than it has been at my place in the last three or four years along about the first of June. Taking the years 1889
1925 to 1890 and down to 1892 and 1893, I couldn't say positively, but I would say that I don't think that the June rise has been any less any way than it had been in the years previous to that. If there was a certain amount of snow fall in the mountains and if that snow melts very quickly and it all runs off at once, that would tend to create a greater rise in June than if it melted gradually. If the cutting off of the timber in the mountains has affected the melting of the snows and the consequent rise of the river, the effect of that would be to gradually increase the June rise. I don't want to be understood as saying that the deforesting of the mountain slopes along the Arkansas river was the sole cause of the decrease in the flow of the river. I think that the taking of water from the Arkansas river by what is known as highline canals and spreading it out on lands not riparian, that are uplands and miles away from the river, has had an effect to decrease the

flow of the river. The water is carried away from the river and out of the valley upon the high lands and there is no question in my mind but what that water is lost to the flow of the river. I think it has a great effect there on the flow of the river. The water is
1926 carried too far out. (Objection.) I have observed the irrigation and the canals in Colorado, and I think to a certain extent the building of large canals there has had something to do with the decrease in the flow of the river here. (Objection.)

Cross-examination.

By Mr. DAWSON:

I don't think there is any ditch on the river anywhere in Colorado that carries the water out of the water shed of the Ar-
1927 kansas river. The drainage from all the lands that are irrigated within Colorado that I know of is certainly naturally back to the river.

Recross-examination.

By Mr. CAMPBELL:

I have never noticed any return waters here in Kansas. That water goes into the underflow and comes out in the river, of course. I have never noticed any water coming out into the river from the ditches after the water has performed its functions of irrigating the land. There are no ditches that I know of that come out into the river except our own, and that one runs into the river.

Redirect examination.

By Mr. SMITH:

1928 Very little of the water that is taken out onto the upland by an irrigating ditch, five or ten miles away from the river, and spread upon cultivated land where it is thirty or forty or one hundred feet down to the sheet water would return to the river. It is a well established fact that four-fifths of the water of that region goes to the upper atmosphere anyway. It goes on the surface. Certainly the farther you get away from the river with your ditch and irrigating, the less can possibly return to the river. It is most assuredly according to my belief that the water that is spread out on the upland only a small percentage of it would return to the river.

Recross-examination.

By Mr. DAWSON:

I said that when water is spread on the land four-fifths of it goes into the air. That goes up there and comes down in rain somewhere. So that if you spread it over the land for irrigation and four-fifths of it goes up into the air it would most assuredly increase the rainfall. It would improve or increase the conditions for it.

Redirect examination.

By Mr. SMITH:

1929 I have a complete record of the prevailing winds in this country in the summer season. They are generally from the south and west, mostly from the southeast this summer. Our rains all come from the west, but the direction of the rains I couldn't say. It depends on what direction the wind may be in when it is raining. I don't mean that the clouds particularly come from the west; they are formed right over our heads here. The rain is in the atmosphere. It is there now. There are no clouds there. Whenever it becomes condensed enough or forms clouds it comes down. For the last two or three years we have usually gotten our rains here in the summer when the winds were from a southern direction. (Objection.)

1930 E. N. KEEP, Garden City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Garden City, Kansas, for about twenty years. I am publishing a newspaper and doing a little of real estate business. I am acquainted with the Arkansas river and should think it was about fourteen hundred feet wide at Garden City. Examining Complainant's Exhibit A–45, I recognize it as a photograph of the river at the bridge here south of town. I have understood from Mrs. Stroch, the photographer, that that picture was taken in
1931 June, or it might have been in May, of 1904. That picture shows the condition of the river as it was during the spring of 1905. I crossed it several times. I believe that picture is a correct photographic view of the river as it appeared during the months of March, April and a part of May, 1904. It shows no water flowing in the river at all.

Examining Complainant's Exhibit A–50, I recognize it as another view of the river, taken at a later date, showing the bridge across the river, taken in July, 1904. This is water that is shown in the foreground of the picture. The river was at the time that picture was taken at a good stage of water.

(Complainant's Exhibit A–50 offered in evidence.)

1932 I was acquainted with a lake or pond near the fair grounds between Garden City and the river. I first became acquainted with it about 1883 or 1884. In the broadest place I suppose it was probably not over one hundred feet across and probably three hundred or three hundred and fifty feet long. I have seen young boys in there swimming, and I judge it was up to their arms frequently. It was a swimming hole. As to where this pond got its supply, my

knowledge would only be supposition, that it was fed from
1933 the underflow or from a source higher. I say it was fed from the underflow because it was so near on a level with the river. It had no perceptible inlet. There was no surface water flowing in it only as rains might occasionally cause it to flow in. It was not connected with the river so as to get any supply from the visible flow of the river. There was an outlet farther down east that flowed across the street where there is a bridge. It flows into the river. The water in that lake or pond has largely disappeared. There is some little water there lately, I think, this year. I don't think there was any in there last year. I didn't see any. And my recollection is that for several years before there had been but very little water in the pond.

Cross-examination.

By Mr. BEAMAN:

1934 I wouldn't call this pond a bayou exactly, because it seems to have a flow down to the river, and when the river is flowing it has its outlet into the river. Yes, there has been some little water in the river, and sometimes considerable, ever since the first rise in June, and there is quite considerable water in that pond now. It is less than a quarter of a mile from the river, and I think it is a fact that sometimes the water level in that pond now is considerably higher than the water in the river. As to whether the probability is that the underground supply to that pond does not come all from the river, I don't know as my opinion is of any value. My opinion is that there is a cut-off or stratum of soil impervious to water higher up that shuts the water off to some extent from the river and causes that. There still may be a source of supply to
1935 that pond from a different direction than from the river altogether. The water in the river this year was in July very high, and as high as it has ever been in July, and higher than in some years. Nevertheless that pond is not nearly as full as it used to be. I haven't been down to see the river to-day and I don't know whether there is any water in it.

1936 C. A. LOUCKS, Garden City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Lakin, Kearney county, Kansas. I have lived there since 1878 or 1879 continuously. I am in the real estate and abstract business. I have been acquainted with the Arkansas river and the Arkansas valley in my county during the time I have lived there.
I live about half a mile from the river. The valley through
1937 Kearney county is on an average about three and a half miles wide. At Lakin it is about seven miles wide. The valley

consists of first and second bottom lands. The first bottom lands vary in width from a few feet to possibly a mile in some places. The balance of the valley is second bottom. The second bottom is on an average ten or twelve feet above the first bottom, and the second bottoms are fourteen to twenty feet above the surface of the water as it flows during the dry season of the year, and
1938 the first bottoms are six or eight feet above the river. We strike water anywhere in the valley through Kearney county by digging for it. On an average of about six feet on the first bottom and from sixteen to twenty feet on the second bottom. During the first ten or fifteen years that I knew the river the average flow of the river during the dry season of the year, not taking into consideration the flood periods, would be difficult to state,
1939 but in my judgment there was a foot of water in depth and about three hundred yards wide. (Objection.) I should think that on an average the river through Kearney county is about the same width as through Finney county at the bridge crossing the river south of Garden City. A portion of the time during the first ten or fifteen years the river would flow from bank to bank. (Objection.) During the first fifteen years, from 1878 or 1879 down to 1885 or 1887, there was such a thing known as the June rise, which would last several days and would go out gradually I think. During the last ten years prior to 1904 I don't know what the average flow of the river would be. As to the average flow dur-
1940 ing the last ten years as compared with the flow during the same seasons during the first years, there is but little water now as compared with the other period. (Objection.) I don't know how much of a flow there was from August, 1903, to May, 1904, but there was but very little.

Examining Exhibit A–45, that picture is a fair view of the river through Kearney county during the last four or five or six months of 1903 and the first few months of 1904. (Objection.) I
1941 take it that it shows no water flowing in the river at all. The river has materially decreased in its flow during the dry seasons of the years as compared with the earlier years. (Objection.) The first time I ever knew it to be entirely dry or without running water was in the year 1887. Since 1887 it has been entirely dry numerous times. That is practically true in the fall of every year.

There are three ditches in Kearney county used for irrigation—the Western, the Great Eastern and the Amazon. The Western ditch was constructed about 1880. After the parties began working upon it they continued their work uninterruptedly until it was completed and they commenced to put water in it and use it.
1942 They put the water in it immediately after they got it started. That ditch has been used ever since and there has been water in it at all times since when they were able to secure the water from the river. There have been some times since that when they were not able to secure water for the ditch. During the first years after they turned the water in there was plenty of water in the river and

they got plenty of water in the ditch then. During the last five or eight years, excluding the year 1904, there has been but very little water in the river, and consequently very little water in the ditch, only at certain times. The Great Eastern was constructed about the same time as the Western, about 1880, is my judgment. The
1943 ditch was pushed to completion from the time they started it, and the work was not interrupted or abandoned at any time to my knowledge until they turned the water in. I would have known it, I think, if it had been. They got water the same as they did in the other one, for a portion of the time. They had water for the ditch during the first years. During the last five or ten years prior to 1904 they have not had the water, but with this Great Eastern I think there was a portion of the time that they didn't try to operate it. I think the diminution of the water had an effect on their ceasing to operate the ditch. I don't know exactly when the Amazon ditch was constructed, but I would judge some four or five years after the Western and the Great Eastern were con-
1944 structed. After they began constructing the Amazon ditch there were several miles of it finished without interruption (objection) and then they began operating it and turned water in it. The head-gate of the Amazon ditch is about eleven or twelve miles west of Lakin. It then passes about one mile north of Lakin. The diminution of the water in the river has effected the amount of water that was gotten in the Amazon ditch.

1945 Cross-examination.

By Mr. HAYT:

The Western ditch runs about three and a half miles from Lakin. The head-gate of that ditch is about eight or nine miles above Lakin. The Great Eastern runs about half a mile north of Lakin and the head-gate of the Great Eastern is about eight or nine miles above Lakin, and the Amazon head-gate is about eleven or twelve miles above Lakin. I first saw the Amazon ditch when they were building it. I don't remember definitely to what stage the building had progressed when I first saw it. I don't remember whether it was constructed three or four or five or six miles when I first saw it. I saw it most all the time, every few days, during the first two or three years after the construction was commenced. The ditch was close to where I lived a portion of the time. I was
1946 living in Hartland a portion of the time, and it goes right through the edge of the town. One of the others also goes through Hartland—the one on the south side of the river. Yes, as to some of them I can testify that I noticed the ditches during the first year or two, during the time they were constructed. Yes, I can testify that there was a portion of the Amazon constructed uninterruptedly. Yes, I will testify that a portion of the Amazon was constructed uninterruptedly. I do not testify of my own personal knowledge that the work was continued uninterrupt-

edly as to all of the ditch, but only as to a portion of it. There is a portion of it I have never seen, and as to that portion I don't know when it was completed except from what I have heard.

1947 I think the Arkansas river at Lakin may have had what might be termed an average flow. What I would call an average flow of the river would be the average amount of water that would pass down through a given time. At the present time it is a river of sudden rises and violent changes so far as the water is concerned, and to a certain degree it has always been so. Yes, sir, as early as 1887 there were dry times, and it was full of water at other times. I think it is impossible to determine an accurate average as to the flow. As to the June floods, I think they would last

1948 longer in the earlier days than now. My recollection is that in the early days the river would be high during the greater portion of the month of June. It is not my recollection that they always came in June, but they generally continued for some time. As to a series of rises in the river, I would say it would be up for three or four days, and down, and then there would be an increase, perhaps. I was not upon the river in 1874.

I don't know when the photograph identified as Exhibit A–45 was taken. I think I recognize the place it represents. I don't know whether it represents the true condition, independently, of the photograph itself. It was taken at Garden City, Kansas, below the head of the three ditches above described. The Western ditch at its head is about sixteen or twenty feet wide at the bottom of the ditch. That is my best judgment. And it is approxi-

1949 mately from four to six feet wider at the top. When the ditch is filled it carries about three or four feet of water in depth. The Great Eastern ditch is approximately about eighteen feet at the bottom and about three or four feet wider at the top and carries water in depth about three feet. The Amazon is about eight or ten feet at the bottom and at the top is nearly twice as wide, and the depth of water in the Amazon is about three or four feet. These ditches, I think, were all constructed so as to take water from the river at its lowest flow. Yes, sir, I believe that these ditches were constructed so as to take all of the water from the river if there was very little water in the river; that is, if there was only enough water in the river to supply these ditches they were so constructed as to take it all. Yes, there were some dams constructed in

1950 the river to throw the water into the ditches. The Amazon a portion of the time had a wing, a temporary dam throwed in. The Great Eastern and the Western ditches both have had dams. I don't know whether they have dams now or not. I believe the Western has a dam at the present time. I don't know whether it extends across the river or not, I think the others also have a dam at the present time. Yes, sir, it is the aim and purpose to fill these ditches with water whenever the river will permit. They are so constructed that whatever there is in the river may be taken out up to the capacity of each ditch.

1951 JAMES CRAIG, Garden City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live about three and a half miles north of Garden City. I am fifty-three years old, and have lived in Finney county since March, 1879, at which time I located on the present homestead where I live. My business has been farming, and I have always owned the farm, and have sometimes farmed it. During the first ten years after I came here I had charge of some ditches in this
1952 neighborhood. I am a stockholder in the Kansas ditch and helped to construct that. I know of ditches in Kearney and Finney counties, but I don't know as to Hamilton county. The first ditch that was constructed here was the Garden City ditch. That is the present ditch in the valley here. The first work was begun on that in the fall or the winter of 1879–1880. (Objection.) That ditch was the one that was chartered under the name of The Garden City Irrigating, Water Power and Manufacturing Company, and the charter of which is filed as Complainant's Exhibit A–47. In the first place, this ditch was started for a mill race and was not intended for irrigation purposes. Afterwards some farmers over west came in here and saw the chance to irrigate from this little canal that had been constructed and asked for water to irrigate with.
In the fall of 1879 they simply took their scrapers and went
1953 up to the river. There was quite an island extending up the river three quarters of a mile or more and they started in there above the level of the river bed and used this island as a wing dam. They put a dam across between the island and the main land and constructed the ditch to west of Garden City here a short distance and throwed the water out on the prairie. This work was pushed uninterruptedly and continuously. Mr. Armentrout
1954 had charge of the work at that time. I just came in through the summer and watched the progress of the work and saw what they were doing. It was something new to me. They had the water running out on the prairie in this ditch early in the spring of 1880. That ditch did not exceed three and a half miles to where they turned it out in the prairie here at that time. It was afterwards extended from ten to twelve miles or more, with laterals and all. It runs into the river east of Garden City. There were ten or twelve miles of it constructed, so that water was turned into it. I think there has been no year but what water has been used from it, to the best of my recollection. There was considerable irrigation done from this ditch up to 1887 in the end of the boom days here. There was considerably more done early in the boom
1955 than afterwards, and up to the present time in fact. There is not as much irrigating done from this ditch now as there was in 1885, 1886, 1887 or 1888. As to why there is not, I don't

know as to that. The ditch has simply been filled up and it has been in the hands of a receiver and the mortgage companies have had charge of it, and it has just simply gone down and down—the the property has gone down. That is the case with all of the ditches in here. During the last ten years prior to 1904 there has been sufficient water to supply these ditches if they had been in condition to take it along in May until the middle of August. There is nearly every summer, I think. There has been plenty of water for two or three months. During the dry season of the year, from August until the last part of the year, there has not been a sufficient amount during the last ten years. During the years from the time the water was turned in until about 1890, we had plenty of water. We would always have water here in the spring of the year to start our spring crops—that is, our grain. The fact is I have quit raising summer grain on account of that. We can't get water enough to start it in the spring. In the years from 1880 to 1890 we could get water enough for our irrigation purposes. There were times when it was low. There would be always plenty to make crops, however.
1956 But during the last ten years the water has been practically out of the river in the dry time of the year, and if the water is out of the river there is none in the ditches.

The next ditch constructed was known as the old Kansas ditch. That covers my own farm. The charter of this ditch is Complainant's Exhibit A–46. We took up the work on that system in the fall of 1880 and pushed the work until we got water up on the fields or up on my territory. That was in the summer of 1881; we got the first water up to my place along in July, 1881, about fifteen miles from the head-gate. The head-gate of the Kansas ditch is just on the edge of Kearney county, right on the west like of Finney county. The head-gate of the Garden City ditch has been moved several times. The old original head-gates were on section
1957 16, about four miles west of Garden City. The work on the Kansas ditch was pushed uninterruptedly until the water was turned in in the winter of 1881. I don't know but we may have gotten some late in the fall. We put the little head-gate in a short time after we got the work completed so that we could run it down and keep the water going, but there was no water used until 1881. The water was continuously used in the Kansas ditch for a series of years, and we have always had water up there. The diminution of the water in the river has certainly affected the amount of water that could be used in this ditch during the last ten years. During the last ten years prior to 1904 there have been periods of from five to nine months when we haven't had the water. During the years from 1881 when the water was turned in until 1890 we had water; that is, there were times when it might
1958 have been short a little, but we always had water in the irrigation system. The Kansas ditch for the first ten years was about fifteen miles long. The cost of constructing the Garden City ditch was perhaps ten thousand dollars, and the cost of constructing

the Kansas ditch was probably fifteen to twenty thousand dollars. The name of the Kansas ditch has been changed since that time and it is now known as the Finney County Farmers Irrigation Association.

The next ditch constructed was the Great Eastern, and Exhibit A-48 is a copy of the charter of it. The head-gate is located
1959 right at the little town of Hartland in Kearney county. The survey was started in July, 1881. I carried the rod on that, and know, and the work was started in November of that year. There was a period in 1883 during the summer that they had some difficulty with the railroad company and they took their teams and marched out and sent us down to the cattle ranch for a short time, probably five months. I had charge of it until 1886. We continued to push the work right along continuously. The water was turned into that ditch in the fall of 1882 and ran down about fifteen miles. This ditch has been extended, but they never complete these ditches. During this five months they let the farmers run the ditch and a few of them along close to Lakin let their head-gates sink into the river and when I got back from the cattle ranch they had not been trying for some time to take any water at all. The head-gates were sunk. They have extended this ditch, but they never complete these ditches. They are always extending and fixing
1960 them. But they ran water right in this country. The first contracts were made in 1884 and the water was continued up to 1886. When I quit them we had continued it right along, and it has been operated ever since to my knowledge. During the first ten years after that ditch was operated at most times they had sufficient water for the purposes of irrigation. During the last ten years I have not been up in that country, since I lived there in 1886. The main ditch is probably thirty-five miles long.

The next ditch that was constructed was the South Side ditch. I don't really know what the name of that ditch is now. It is the ditch that takes water right across from the head-gate of the Great Eastern, on the south side of the river, at Hartland. The first took out a small ditch, the Minnehaha ditch. They came out a short distance this side of Lakin, but afterwards Mr. Longstreth and others came in and they went farther up, as far as the head-gate of the Great Eastern. I think they call it the Western. That ditch
1961 comes down from the narrows at Hartland to Sherlock. We knew the Minnehaha ditch as the South Side ditch, and they were building it when we were working on the Great Eastern. They put in their gates about the same time and took water out about the same time that we did. They worked on it through the summer of 1880 and used water in it in the summer of 1881. I don't think they did any irrigation in that ditch, to any extent, through the summer of 1881, but they had water in there. I frequently went across there to see what they were doing. I was working on the north side of the river. They pushed their work uninterruptedly in the construction of that ditch. They had a short ditch and a

good fall to it and didn't have much to do to construct the
1962 ditch. That ditch was about fifteen miles long. They had plenty of water in it for irrigation purposes for the first number of years, but they have not had water in it during the last ten years prior to 1904 to my knowledge. I couldn't say. I have not been up in that country. But I suppose they wouldn't have because there was no water in the river. The Western ditch would cost I should say twenty thousand dollars.

The next ditch constructed was the Amazon, whose charter was filed in 1887 and is Complainant's Exhibit A–49. My recollection is that they started to work on that along in the fall of 1887. The work was continued uninterruptedly until it was completed. They pushed that rapidly when they started in at the work. I couldn't positively testify when they got water into that ditch. They may have got something in there in 1888 for a short distance. The water has been used in that ditch continuously ever since when they could get it. The Amazon ditch is about a hundred miles long or more
1963 and goes east to Ingalls and out to Pawnee. It was intended to cover the whole country here. I don't know what the cost of that ditch was, but I should judge from the work they did it cost one hundred and fifty thousand dollars. The head-gate of the Amazon is at a place called Slate cut, near Kendall, in Kearney county, five miles above Hartland. There have not been any ditches constructed since that time that I know of.

Cross-examination.

By Mr. DAWSON:

I was interested in the construction of two of these ditches—the Kansas and Great Eastern. I came here from Illinois and was not familiar with the Arkansas river prior to 1879 when I came
1964 here. I knew nothing of the Arkansas river before that time. Yes, sir, I discovered very shortly after I came here that to make farming a success in this locality it would require the application of water to the land by irrigation, and when we discovered that we set about trying to get water on the land, and in doing that I aided in the construction of at least two ditches, and we have been irrigating more or less upon our land from the time of the completion of the first ditch to the present time, and we are still irrigating some. No, I think it is not possible in this part of Kansas which lies between the Colorado State line and Dodge City to rely upon crops year after year without irrigation. I will have to approximate how many acres of land there are in Finney county that lie under ditch suitable for irrigation. Roughly speaking, probably fifty thousand acres. That would not include all that is so situated under the ditches that it could be irrigated if we had water for it.
1965 There is now probably a hundred thousand acres of land in Finney county that is so situated as to be capable of irrigation from the systems which have been constructed if they were in

repair and we had water to fill them. Irrigated lands where the water right is ample in Finney county are worth on an average thirty-five dollars an acre. If they were absolutely deprived of the right to water for irrigation these lands would perhaps be worth two dollars are a half per acre. That would be an outside figure. The amount of land lying under ditch in Kearney county is probably twenty thousand acres. There would be more than that amount of land which actually lies under ditch systems in Kearney county, taking in to consideration the Amazon, the Great Eastern and the Western. The land lying under all the ditch systems in Kearney county that are suitable for irrigation, if the systems were in proper repair and there was plenty of water for them to irrigate there would probably be thirty thousand acres. The Amazon
1966 I think extends north further than probably I have knowledge of it, and it may cover a greater territory than I think it does. I am not familiar with the ditch systems nor the lands lying under them in counties other than Finney and Kearney in Kansas. I think the relative value of lands in Kearney county when allowed water for irrigation and when deprived of it would be about the same as values fixed for lands in like condition in Finney county. Yes, there is a considerable area of land suitable for agricultural purposes in these two counties which could be brought under irrigation if we had the water supply for them, and that are not already under irrigation.

I am familiar with the flood conditions which exist in the Arkansas river from year to year. Yes, it is true that there are large quantities of water which run to waste each year in the Arkansas river. If those waters were stored so as to make them accessible to ditches in Kansas many thousands of acres of additional land would be increased in value in the proportion I have heretofore
1967 named by placing water upon the land. No, I couldn't give any estimate as to how many acres could be reclaimed in that way if the water could be secured. Yes, it is true that the amount that could be reached and made valuable in that way is in *in* excess of the amount that has already been thus reclaimed by irrigation.

So far as my knowledge goes there is only one reservoir site or suitable place for storing the flood waters of the Arkansas river between this point and the Colorado State line. It is at Hartland; that is, right at the town of Hartland, where the Great Eastern and the Western ditches take their water. There the hills are two hundred feet high, I should judge, on each side of the river, and the valley is very narrow. The valley widens right west of that point. I don't know how far it would back the river up in the valley. It would make a large reservoir. I have driven up and down
1968 the Arkansas river on both sides in Colorado. I should say emphatically that if there are suitable reservoir sites in Colorado it would be of advantage to western Kansas if the flood waters of the Arkansas river falling at the head waters of the stream and its tributaries could be stored, if these flood waters were conducted

down the channel so as to reach the ditches constructed in Kansas. Yes, sir, if the Federal Government in the expenditure of the moneys set aside for the reclamation of the arid region should construct large reservoirs on the Arkansas river in Colorado and fairly distribute that water between the people of Colorado and of Kansas, it is my judgment that it would be of advantage to both States. I should say that the welfare of the majority of western Kansas, at least that part west of Kinsley, depends largely upon the ability of the citizens of that part of the State to secure water for the irrigation of their lands.

Yes, as to the comparative value of lands in this vicinity at the present time with what it has been in part years, excluding boom prices, it is higher than ever before.

Yes, sir, I raise alfalfa. I am on what they call the upland, thirty feet to water, and irrigate that on the surface. Yes, I have had some experience in growing alfalfa where it relied on water in the soil rather than what you put on the soil. As to the best depth to have water under the soil for alfalfa, that depends upon what you want to raise. If you want to raise seed you want the water a considerable distance below; if you want hay, two or three feet beneath the surface would be all right. If you want seed, it will go down eight or ten feet after it has been set. The seed has been the most profitable crop here.

I have taken considerable interest in this matter of irrigation. Yes, sir, I have heard individual views upon the question of this suit and its probable effect discussed among the people of this county. I have talked of it at different times.

1970 Q. If it be true that the amended bill in this case sets up that it is the desire of the complainant, The State of Kansas, to have the water in the Arkansas river run into and across the State of Kansas without diverting it from the bed of the stream, and the result of this suit should be to prohibit both the people of Colorado and western Kansas from taking water from the stream, would that be to the advantage or disadvantage of the people in Kansas living west of Kinsley?

A. It would be a disadvantage to them.

Q. From what you have heard in this county do you believe that the citizens of the county are at all in sympathy with any move-

1971 ment which would look to the abrogation of the doctrine of irrigation? I mean by abrogating or doing away with or killing the doctrine of irrigation. (Objection.)

A. They certainly are not. They are certainly not in favor of doing away with irrigation. That is what I mean.

I have not personal knowledge, but I have my own idea or theory as to what is the cause of the falling off in the flow of the river of late years. My notion is, and I believe, that there is more water taken out in Colorado than heretofore and it has lowered the stream. That is my honest opinion.

Yes, I know that the timber at the head waters of the Arkansas

river and its tributaries has been largely destroyed by cutting and burning, and of course it will let the snow melt earlier. Yes, this would cause a lessening of the flow in the river during the latter part of the summer of late years, but not in the early part of the year I would think. Yes, it is true that the cutting and burning off of the timber at the head waters of the Arkansas river and its tributaries would result in the snow melting more rapidly. Yes,
sir, the water will come down more quickly, the snow not
1972 lasting so long. Yes, it is true that the natural result following
that would be that there would be less water coming down later in the season, but that has not been the case with us. Our water is cut off earlier. If that were true we would have water earlier in the season here. Yes, if the timber is cut off, whenever the sun gets warm in the spring and reaches the snow it will go off more rapidly than if the timber were there, and later in the season the result is that there wouldn't be as much water, because it would all be gone.

You have asked me if I know of any other reasons besides the cutting of the timber and the taking out of more water for irrigation in Colorado which would account for the lessening of the flow of the water in the river. As to that I would say that the rain and snow fall would account in some part for it. As to whether or not there has been less rain or snow fall in the late years, I would say that there has not at this point. I don't know how it has been in the mountains of Colorado. Yes, sir, it is true that the drainage of the Arkansas river in Colorado which lies in the high mountains
where snows fall to any considerable extent is a very small
1973 percentage of the river's total drainage in that State. You
ask if it be true that the drainage of the Arkansas river in Colorado which lies in the high mountains where the snow falls constitutes about one-eighth of the river's drainage in that State—whether I attribute any considerable amount of the flow of water in the river to the snows, or mostly to the rains which fall on the other seven-eighths of the drainage. I will say that I blame it more to the rains that fall in the foot hills. Yes, I know that there has been a very largely increased area of land put under cultivation along the drainage of the Arkansas river in the last ten or twelve years. My idea is that this rain that falls hangs along in the mountains and in the foot hills about Trinidad and up in that country and not directly in the valley of the Arkansas river.

1974 Yes, sir, the soil would absorb the moisture, and when you
break or plough ground up the rain which falls on it furnishes a much less percentage of run-off than when falling on the native sod. It runs off more readily when it is not under cultivation. No, I don't know whether or not it is true that in all this western country that is open range both on the plains or in the mountains the grass or vegetation has been trampled off or eaten off by cattle so that it is much less than it formerly was when the country was new. There is no difference in that, I think, in this

country here. Yes, I know that up in the mountains there are seasons when there is practically no grass at all, and it is true that when you do away with the grass and vegetation that grows on the ground that ground does not hold the winter snows and waters so well as when it is covered with vegetation. It is probably true that in the mountains it would run off more rapidly and does not run nearly so long, but that is not true, of course, with us here.

As to the fact that these ditches of which I have spoken as having had ample water for the first few years after they were constructed, and that later they had not been so well supplied with water, I should think it is true as you state that it was not entirely due to
1975 the lack of water but in part due to the fact that they were not kept in proper repair or looked after while they were in the hands of a receiver.

Cross-examination.

By Mr. CAMPBELL:

Yes, there are places on either side of the Arkansas river where water may be impounded by taking it from the bed of the river and conducting it to a particular place. I know what is meant by return waters. Yes, I gave that matter some study. I couldn't state
1976 the amount of return water that comes back to the stream after the water is used for irrigation purposes. In my judgment there is some. My idea is that the greater the amount you use for irrigation purposes the greater the amount that will return. Yes, sir, I think that if reservoirs were erected in Colorado or western Kansas to catch flood waters that now cannot be utilized for irrigation purposes and the same could be used for irrigation during the dry season, that that would increase the amount of return water and benefit the river below all the way down.

Recross-examination.

By Mr. DAWSON:

Answering your question as to whether or not the spreading of water over the lands in eastern Colorado for irrigation purposes has had any effect on the climatic conditions in western Kansas or any effect on the rainfall, I would say I have kept a record here for eighteen years and I don't see any difference. Sometimes it
1977 goes to the maximum and then down to the minimum. I have seen no change in the last twenty-five years.

Yes, sir, I have a well over on my place where I live, and irrigate with it. Yes, I sank the well before I commenced irrigation. I dug the well forty-two feet. Yes, after I commenced irrigating I noticed a rise of water in the well to the extent of twelve feet. Yes, the water came twelve feet nearer the surface three years afterwards; that is, shortly after we started to irrigate in that neighborhood; and the water stands about the same to-day. Yes, I think that the

sheet or ground water immediately under the surface in this valley follows the contour of the surface of the country; and in answer to your question, I couldn't testify from personal knowledge whether or not if you go back from the river to the north until you get twenty-five or thirty feet higher than the level of the water in the river and dig until you strike the first water the water there would be higher than the level of the water in the river. In Dunn's well, about four miles straight north from the river, the water was found some sixteen feet higher than that in the river. I have heard people state that the water was ten feet higher than it was in the valleys and along the side of the hill here. Yes, I know enough of the lay of the country and the depth of the water to know that when we go back from the river it is some higher than the river. Yes, it is my observation that the ground of sheet water under the surface follows in general the rise and fall of the ground; that is, when it comes up the water flows back from the river through the sand. I have had experience in that line. No, I don't know and I don't mean by that that the water which you find back four miles from the river, which is sixteen feet higher than the river, comes from the river at all. Yes, when you get back from the river you find the water underneath the surface of the ground practically following the contour of the surface formation of the country, but I don't mean to say that this water has not come from the river. It may have been in the strata around here and came through those strata. Of course I don't know where it came from. Yes, it is true it may have come from a large amount of rainfall that goes into the ground and strikes a stratum and follows that.

Redirect examination.

By Mr. ASHBAUGH:

Q. Counsel asked you if some of those ditches were in the hands of receivers. Going into the hands of receivers did not cause the flow of the river to diminish, did it?

A. No, sir.

Q. Did the diminution of the flow, of the river cause some of them to go into the hands of receivers, however?

A. Well, that had something to do with it, perhaps.

1981 E. B. STOTTS, Garden City, Kansas.

Direct examination.

By Mr. SMITH:

I live in Garden City, Kansas. I am thirty-two years old, and came to Garden City in 1880 or 1881. My occupation at the present time is farming. I have lived here continuously since I came here, with the exception of about six years. We lived in the city of Garden

City and had a farm east of the town about a mile and a half. I have been acquainted with the flow of the Arkansas river
1982 from 1880 to 1890, and probably saw it every day or nearly so. During the last few years I have lived in Topeka, for seven years, and during the last two years I have lived on the river. There has not been nearly as much water in the river for the last few years as prior to that time. During the first years that I knew it it was a stream that had water, as I remember it, the year round. During the first years we lived here I never saw it dry, not up until 1887 or 1888, along there. In the early days in July, August and September, during the dry months or growing season, it was a running stream. It is now generally a river of sand bars and no water. During the latter part of 1903, down to the spring of 1904, there has been a small flow of water. Part of the time there has been no water to speak of. There
1983 has been some water, however, this year. I should say the river is from one hundred to two hundred feet narrower now than it was when we came here first. The bed of the river is not as deep now as it was then. It has filled up, I should imagine, from one to two feet, varying in different places. From 1879 or 1880 down to 1886 or 1887 there were ponds on both sides of the river and there were lagoons or ponds extending both east and west for fifteen or twenty miles on both sides. The time I didn't put in in school I put in in duck shooting and hunting. Those ponds are not in existence now, excepting one small pond right south of here. I attribute the drying up of these ponds to the fact that the water level in this country has sunk, probably. There is not so
1984 much water flowing in the river as there was at that time. In my judgment, those ponds were fed from the water flowing down the river and from the underflow. When we first came to Garden City we had a cellar dug under our house, a short time afterwards. It was probably six or seven feet below the surface of the ground. In the early days whenever the river was up the cellar was generally filled with water. It frequently was filled with water, and when the river would go down the water in the cellar would go down with it. That cellar has had no water in it in recent years. I have skated on the river when I first came here, in both directions, up and down the river, for a great many miles, frequently as far east as Pierceville. There is not any skating on the
1985 river to my knowledge now; there is no ice to skate on.

I have been somewhat familiar with the supply of water in the irrigating ditches from 1881 or 1882 at the time they were built, down to the time I left here first. In the early '80's there was usually water in the ditches during the summer months. There was a ditch provided from some of those ditches so that the surplus water might be returned to the river. One was about fifty-five miles east of here. In the early days there was considerable water returned to the river as unused from the ditch. The flow was sufficient to wash out the ditch there where it empties into the river to the depth

of three or four feet and back probably fifty to a hundred feet. There was much more water in the ditch than was needed for irrigation purposes. During the last few years, exclusive of this year, there has been but little water in the ditches. As far as we are concerned in the east end of town here, we have had no water to irrigate with.

I am interested in alfalfa under one of these ditches. We
1986 have probably a hundred acres in alfalfa. We have not been able to irrigate that alfalfa for the last thirteen or fourteen years, but we did irrigate it before that. Because of our failure to get water to irrigate the alfalfa the crop has not been nearly as heavy. It has not grown nearly as luxuriantly as during the days when it was irrigated. The vegetation in the first bottom here between the hills and the river was of a sage brush growth. Along near the bed of the river there was a heavy growth of willows and small timber and some larger trees and high grasses. In the early days the grass was heavy and grew quite abundantly. Now the grass is not nearly as heavy as it was and doesn't grow to as great a height as it did. I attribute this decrease in the growth of grass to the lack of moisture and sub-irrigation or underflow beneath the soil.

1987 I was in Colorado three or four years ago. I had occasion about four years ago to inspect some land up there located north and a little west of Lamar, three or four miles. There is an irrigating ditch within a mile of the land. The land was practically a bog, wet and very boggy. We had to turn around and go back; we couldn't cross the land. This was upland, away from the river, prairie land, unbroken and uncultivated. The cause of this was said to have been seepage from the irrigating canal near there and above it. The water had seeped from this canal down through
1988 into this land. I had no occasion to look at any other land except this one piece, but the driver said that the land had been damaged there by seepage from the ditches and that other land in the county had been damaged in a similar manner. (Objection.) This water had evidently seeped from the ditch to this land, as this land was lower than the ditch. There was no drainage to relieve the land of excess water.

It would be of value to our alfalfa if we had water for winter irrigation. We are not able to get water in the ditches for that purpose. The ditches are there as they were built. I believe
1989 one was plowed up this spring, but the ditches are still there. Part of the land has failed to grown anything, hardly, this last year. We have not been able to irrigate down there for the last thirteen or fourteen years, because of the lack of water, in the river.

Cross-examination.

By Mr. HAYT:

A. Yes, it would be of great value to all this land under these ditches if it had plenty of water for irrigation, and it would be

a great benefit to the people of this county if there was sufficient water to supply these ditches with water for irrigation.

1990 Q. If this suit, then, is for the purpose of keeping this water in the river and having it run by, it would not meet with your approval, would it?

A. I don't know that the water running in the river here would make any particular difference to the uplands, but it would probably raise the water level and enable the alfalfa to live in this bottom here as it did in the past.

Q. Do you not think it would be an injury to this county generally if the water was kept in the river and the people were not permitted to run it in their ditches and use it for the purposes of irrigation? (Objection.)

A. No, sir, I think that the country would be better off if the water were running in the river. If the water was not allowed to be taken out the country would not be as well off as though it were used in irrigation, but it would help the country—it would be in better shape than it is today without any water in the river.

Q. My question is that if the people of this county were not allowed to use water for irrigation, would not that be an injury to the people of this county?

1991 A. Yes, sir, if water were running in the river.

Yes, I was about eight or nine years of age when I came here and I am just a little past 32 years old at this time. I think I came here about 1880 or 1881. No, sir, I am not certain in which year I came here. No, I probably did not see much of those ditches in the early '80's, but probably three or four or five years

1992 later, and from that time on. I am not sure, but I believe two were in operation in 1885, and possibly three. I am not familiar with the names of the different ditches. The first ditch I remember of was located immediately south of the railroad track, where the ditch is today. In those early years my observation of those ditches was from the head of them to the place where they emptied into the river below. I was familiar with the places where the ditches were taken from the river and where they emptied into the river, but not very familiar with them up and down the course of the ditch. In speaking of the ditches in those early years, up to 1885 I was only familiar with the one that was taken out near Sherlock, six miles west of here.

Yes, I believe I said that the river was dry in 1887, but I don't know how long a time it was dry. No, I don't know what month in the year it was dry in 1887. I don't remember.

No, there has not been any water in the cellar spoken of in this year, 1904. Yes, the river has had a little water in it this

1993 year. It has not been up, however, as we usually spoke of the river when it was high. No, it has not had a great deal of water in it this year; it has had a little water in it. No, I don't know that there have been several floods in the river this year. No, there have not been several floods in the river at this point this

year. There has not been more water in the river this year than the banks of the river would carry. The banks vary in height above the bed of the river from two to five or six feet. The water has been at its highest when it has been up so that it covered the bed of the river pretty well up on the banks. No, I have not seen it over the banks down here at the fair ground or in that vicinity.

No, sir, I don't know that the river has been out of its banks
1994 near here this year. I wouldn't state that it has not been. It might have been out of the banks and I might not have heard of it. No, sir, when the banks of the river were full this year there was no water in that cellar I have spoken of. I don't know the reason why. Yes, there is a system of sewage in this city now. Yes, these sewers are beneath the cellars in some places and in others they are not. No, I haven't spoken as an expert as to what caused the water to come into the cellar in the earlier years, nor as an expert in reference to sheet or underground water.

1995 Yes, I was in the State of Colorado about the year 1900—either four or five years ago. I should imagine that the land of which I spoke as being boggy, near Lamar, Colorado, was two or three miles north of the town of Lamar and a little west. I don't know what wagon road it is on. The land was owned by W. H. Bradbury, a citizen of Topeka, Kansas. The larger portion
1996 of the tract of land, which I believe was about 160 acres, was wet and boggy. There didn't seem to be any grass growing on it. It seemed to be covered with dead grass, and in some places there was grass. I should say the dead grass was killed by the excess water and the seepage from the ditches. I don't know the name of the driver who gave me the information in reference to the boggy land. I believe he was a land attorney there rather than the owner of the stable. Possibly owner of the stable too.

Yes, I testified that this stream had narrowed up from one to two hundred feet at all points along the river where I have had
1997 occasion to observe the stream, both east and west of Garden City. No, the bridge has not been extended one or two hundred feet, nor has it been narrowed up. The bridge now extends out over the land for a hundred to two hundred feet. No, so far as I know the bridge has not been extended on the side farthest from Garden City, but it may have been possibly one span, if at all. The approach to the bridge may have been rebuilt, and possibly a span put in where it had been washed out by the current. Yes, I believe there was an approach built on the side farthest from Garden City. No, the bridge has not been extended south from eighty to one hundred feet within the last ten or twelve years. It may have
1998 been extended some, but not that far. Yes, there is a bank of about two to three feet in height, I should think, at the beginning of the bridge on the south side of the river at this time. Yes, it is true that the bridge practically commences right at the river bank as it is at this time on the south side of the river.

2000 O. V. FOLSOM, Garden City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Garden City, Kansas, since 1888, and in Finney county since 1882. I have been farming since living in Finney county. In the season of 1883 I was farming about a mile and a half west of Garden City; after that I moved onto my claim in Sherlock township and farmed there for four or five years. The land I was farming in 1883 was bottom land. I irrigated this
2001 land in 1883 from the Garden City ditch. After that I moved onto my claim and irrigated from the Great Eastern ditch in 1884 for about five years. In 1888 I moved from that claim and rented it. During those years we didn't get as much water as we wanted. We got enough to be of great help, especially in 1883. For five or six weeks during the summer season there was a good supply of water in the ditches, but not for all the time. For the last few years prior to 1904 I have not been engaged in farming myself, but from what I have seen of the ditches and what I have heard the farmers say I think the water must have been a great deal less. I saw other ditches in operation during the '80's in this
2002 county, especially the Kansas ditch. I passed it about every time I came to town, from 1883 to 1888. I saw the Kansas ditch in operation in 1883, 1884, 1885, 1886 and 1887, and I think some time since then too.

Cross-examination.

By Mr. DAWSON:

So far as the supply of water during the past few years is concerned, I have not given any real personal attention to that. I have been living in town and engaged in the insurance business. Even in 1883, 1884, and 1885 there was only a part of the growing season that there was ample water for these ditches I have spoken of. My recollection is that in 1883 there was water most of the time during the summer season. I know I was irrigating a good deal of the time during that season. In 1884 and 1885 I was on the Great Eastern ditch and the supply was not so good. I consider that irrigation is essential in this country to make sure and successful crops. I think it is of vital importance to the people of western Kansas to secure sufficient water for the irrigation of land if they desire to make their crops grow and make the land productive. Some crops can of course be raised fairly well without irrigation. I
2003 should say that the lands which have an ample water right are about two or three times as valuable as the same lands would be without an ample water right for irrigation.

2004 MILLARD F. GRIGGS, Garden City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Garden City for the last 13 years, and in Finney county since 1882. I lived for a while a mile and a half east of Garden City. I saw people in Finney county irrigating in 1882, a mile and a half east of Garden City, from the Garden City ditch. They all seemed to have plenty of water around here. I did
2005 irrigating in 1883 myself from the Garden City ditch. There was plenty of water in the ditch that year at any time. I irrigated in 1884 from the Great Eastern ditch for six years, from 1884 to 1890 I was at the eastern end of the Great Eastern ditch in 1884 and only got a small amount of water, just as it got down as far as I was that year. I was 25 or 30 miles, probably, from
2006 the head gate. I think other people were irrigating in 1883 from the Kansas ditch, but I had no particular business with it myself. The supply of water in these ditches was quite good down to 1890. From about the year 1895 down to 1904 the supply of water was very limited, but in 1904 it was better than usual. My business is real estate and insurance. The population of Garden City is about 1,700. In 1885, 1886 and 1887 it was estimated as high as 8,000. My best judgment would be that in 1890 the
2007 population was about 12,000. The population of Finney county at the present time is not far from 3,500. The boom had subsided and things had gotten pretty low by 1890. The city of Garden City is under the Garden City irrigating ditch and
2008 it gets its supply of water from that ditch. Some individuals have sources of supply outside of the ditch, from wells.

Cross-examination.

By Mr. HAYT:

It is necessary to irrigate here during ordinary years for the successful growing of crops. The land here that is under irrigation is much more valuable than that that *that* is not under ditch. As to whether that is true of this whole arid region from Kinsley to the Colorado State line, I don't really know except as to hearing it. I suppose so. We haven't had a good water supply in this county for so long that values of land have decreased. We have had pretty fair service this year, but it has been so poor for the last few
2009 years that it is hard to get it. The average value of farm lands here under the Garden City ditch, with such water supply as has been furnished by that ditch of late years, runs from twelve to fifty dollars an acre. I should say the average value was about twenty-five or thirty dollars. If we had a full water supply all seasons of all years, the lands would be much more valuable.

The people of this county are interested in the use of this water for irrigation, and the lands are more productive and much more valuable if irrigated than if not. We can't grow general crops here successfully without irrigation. I think we can raise cane probably more than half of the time without irrigation. Barley is a fairly good dry land crop, but not so sure as cane and kaffir corn. Generally we raise cane, kaffir corn, and broom corn. We don't raise alfalfa outside of irrigation. The other crops we generally raise here are alfalfa, wheat, barley, and Jerusalem corn. All these
2010 crops are improved by irrigation, and some kinds can't be raised at all, ordinarily, without irrigation. The average value of irrigated lands when the supply of water was good in the ditches was double what it is now under some of the ditches, because we had more water. Our interests and those of the citizens of this county is in obtaining the waters of the Arkansas river for the purpose of irrigation. I think it would be to our advantage to have the waters even run by here, because the water is at a
2011 greater depth, and where we depend some upon the alfalfa roots tapping the moisture below it doesn't do it so readily now as when the water stood high in the river. The more the water runs down the river the higher it stands over the bottom and the better it is for alfalfa crops. It wouldn't be to our advantage to be deprived of this water for irrigation. It would be very much to the detriment of this community if this water could not be used for irrigation. When I said that the water stood higher over the valley I meant under the surface.

2012 W. R. PATTERSON, Garden City, Kansas.

Direct examination.

By Mr. SMITH:

I have lived in Garden City, Kansas, for a little over four years, and have lived in Finney county since 1886. I am superintendent of the Farmers' Irrigating Association which was formerly known as the Kansas ditch and have been running this ditch most all the time since I have been here. I commenced as superintendent in Feb-
ruary of 1887. I was on the ditch pretty nearly all the
2013 time until the farmers bought it. When I took charge of that ditch in 1887 we had a good flow of water most all the time. We had an ample supply for irrigation through the growing season—August and September. The river didn't go dry but one time during that summer and stayed dry a little while. When I commenced on the ditch in 1887 there was no waste gate or dam in the river at all, and that spring we started in and put in a set of waste gates. We got the piling drove, but the water got in the way so that we couldn't get the gates in. We just put in some temporary things there for that summer, and then I ran a little sod bank

up the river for two or three hundred yards, long enough to bring it up a little ways and catch the water we wanted. In 1888 I suppose we ran it two-thirds of the way across the river, and in 1889
2014 we put it clear across. In 1891 and 1892 the supply of water was pretty good, up until along about 1893. I believe it was not so good then. In 1895 we had a pretty fair head of water a good deal of the time during the season. In 1896 we had very little—hardly any. From 1896 down to 1904 we would have a little run of water but it wouldn't last very long. We have not had anything like enough water for irrigation in the growing season in those years. We didn't have a good supply of water. We had water at times. The supply of water from 1893 down to 1904 during the growing season was not nearly so good as it was when I first took charge of the ditch. It was less, I suppose because there were more ditches taken out of the river. The Kansas ditch depends on the river for its supply of water. The flow of the river from 1893 down to last year was not nearly as good as it was when I first took
2015 charge of that ditch, and as a result we had less water in the ditch. This year has been the best year we have had for some time. Prior to this year I will say there was half as much water in the river, taking the summer through, as in 1887. The river at this point during the growing season for the last few years has been frequently dry. I can't attribute this to anything unless the ditches in Colorado are doing it all the way up the line. I have been in Colorado in recent years and have seen the ditches there. I have been on the Highline, and have been at the headgates, and have been pretty well over the Highline ditch. It would be my judgment that the putting of water onto the
2016 uplands there is what has diminished the flow of the river. They run the water out on the high lands there where it has a poor show of getting back. It didn't look to me like it would get back to the river. The decrease in the flow of the river and in this ditch has affected the lands under the ditch in this part of the country a good deal. It has set the country back a whole lot too. The water level under the ground here, what we call the underflow, I know has lowered in the last five years. I don't know as I could say just how much, but I know when I first came here they couldn't hardly use their cellars in Garden City on account of the water rising in them, and now anywhere here you can't strike water at less than ten or twelve feet the year round. This would indicate that the water had dropped four feet anyway. During the years from 1893 down to last year it is a fact that the Kansas ditch was almost abandoned so far as using water is concerned, and it couldn't
2017 get the water supply. I have been familiar with all the ditches here in Kansas. The company I used to work for owned all three of these ditches—the Kansas, the Garden City and the Great Eastern ditches. I worked on all of them. The facts I have testified to in regard to the Kansas ditch are substantially the

same with regard to the other ditches, and the decrease of the flow in the river.

Cross-examination.

By Mr. DAWSON:

This Kansas ditch was in the hands of a receiver for some time. It is very likely that the fact that the company was practically bankrupt and its property in the hands of a receiver had something to do with the fact of its not being kept in repair and not
2018 used so much for irrigation. But the ditch didn't hardly pay running expenses. That had something to do with it. That fact as well as the shortage of the water had something to do with this dilapidation. There are ditches above the head of the Kansas ditch, which we now call the Farmers' ditch, in Kansas, that are taking water from the Arkansas river. Some of these ditches are younger than the Farmers' ditch. The Farmers' ditch and the Great Eastern ditch and the Western ditch were taken out before I came here. I don't know just exactly the difference between them, but the Amazon ditch was taken out at a later period than the Farmers' ditch in 1888 and 1889. The head of the Amazon is above that of the Farmers, and lands have been irrigated under the Amazon in each year since it was taken out. I think at present the Great Eastern and Kansas are both larger than the Amazon ditch. At present the Amazon is about one-third in size. It used to be a large ditch,
2019 but has filled up now until the capacity is not very much. I don't know what it is. I don't know how it would average up as to width and depth, but I have seen places in it that wasn't over ten feet. I was not here when the ditches which are younger than the Farmers' ditch up the river were taken out, but I have heard that there are some that are younger. During the years I have spoken of when the Farmers' ditch was not getting the water it needed for the irrigation of the lands lying under it, we didn't take any steps and the receiver in control of the Farmers' ditch didn't take any steps to compel those younger ditches, including the Amazon, to let the water come down to it, so far as I know. The company I was working for was taking steps to close the Amazon down to the Great Eastern, but they didn't have the Kansas ditch in it at all; so that these younger ditches at the time the Farmers' ditch was short of water were taking water out of the river above it. This country is supposed to be a country for irrigation, about Garden City. We can't raise good and successful crops without the
2020 application of water to the soil by irrigation. So far as the people of this county and the counties to the west are concerned, it is of vital importance to them to increase the facilities for irrigation as much as possible. I should think that land in this county would be worth $40 an acre, with an ample water right for irrigation, and without it it wouldn't be worth over four or five.

Four or five would be pretty high for it without any water
2021 right, and $2.50, or nothing, would come nearer the value.
We have got 8,600 acres covered under this ditch that I am superintendent of, that have water rights, but there is considerably more land under there that can be irrigated, but they haven't the water rights, and we haven't the water to spare to water them. As for the amount under all the ditches, I couldn't say. I think there would be 20,000 acres of land under the Farmers' ditch that could be irrigated if we had the water. I expect that under these ditches in this county there must be somewhere from a hundred thousand acres up that could be irrigated profitably if we had the water, and I guess the same is true in a measure of the lands in Kearney county.

I have heard the people of this vicinity speak about this suit.
From my knowledge in this and adjoining counties and from
2022 my acquaintance with the people who are dependent upon the land for their support, I believe that the citizens of this and adjoining counties would not be in favor of the establishment of a doctrine which would prevent their taking water out of the river for irrigation.

I said that I thought the underflow here had lowered. I don't know what I base that opinion on unless it is that the river is dry so much. That is all I can see for it. I have put down wells here in different parts of this country. I noticed that the underflow had
lowered by my observation as to cellars that had been dug.
2023 As near as I can remember, the water was in these cellars back in about 1886. I don't think there has been any water in them this summer. There have been times this year when there has been lots of water in the river. There has been a system of water works put in this town since 1886 and that drainage or sewer system empties down the river somewhere. I don't know how the pipes are sunk in the ground over the town, but I don't think it is as low as the bottoms of the cellar over most of the town. I suppose it is made on purpose so that it will drain from water closets and closets put in houses and on the alleys and places of that kind. I was here when it was put in. I saw the streets dug up when they were laying them. The ditches looked to me to be about four feet deep. I think they put tile pipes in them. As to the effect the digging of the ditches over the town and conducting them off to the river and laying in this tiling would have in reference to the water or
moisture in the soil, I suppose if there was water there it would
2024 lead it off and drain it, but any place I have ever seen them dig there was no water there. They didn't go deep enough. I suppose this cellar I saw water in was something like six feet deep, but I don't know how deep the water stood in it, but I know there was water in it. They have what we call storm sewers or places for the rainfall that falls into these sewers to run off instead of going into the ground. I don't know whether that would have any effect on what I call the underflow here or not.

I know where the Hopkins place is here in the city. It is in the west part of the town. I don't know that I ever noticed any wells or cellars there, in regard to the water.

2025 I have seen that he had some wells there. I don't know to what depth you would have to go in that part of the town to water, but I suppose something like ten feet. It is that most any place here in town. If you struck water at 11 feet there in 1887 and it still stood at 11 feet, there ought not to be much change in the underflow in that part of the town. I don't know whether that is true, that the water stands 11 feet from the surface there at this time.

Redirect examination.

By Mr. SMITH:

The river is not so wide here now as it was in 1887 along by the head of our ditch. I expect it is three or four hundred feet narrower up there at the head-gates. The bed of the river has filled up considerably since I came here. Mr. Hedge is superintendent of another ditch here, and he and I were talking about it and we thought

2026 it had filled up from two to three feet. For the last ten years, exclusive of this year, the June rise in the river has not been as large as it was formerly. We generally have a June rise, but of recent years they don't last as long as they used to.

Recross-examination.

By Mr. DAWSON:

I think the river has filled up something like two feet here near our head-gate, but I am not speaking about these head-gates altogether. Our dam across the river runs from 18 inches to five feet high and extends clear across the river near the head-gate of the ditch.

Redirect examination.

By Mr. ASHBAUGH:

The Kansas ditch and the Farmers' ditch are different names for the same ditch, and that same ditch was possibly called the

2027 Illinois ditch. It was also often called the Hudson ditch.

2028 C. A. SNYDER, Garden City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live here in Garden City and am acquainted with the ditches in Finney county. The Illinois ditch is what is known as the Farmers' ditch, formerly the Kansas ditch. The terms "Illinois," and "Kansas" and "Farmers" are just three names for the same ditch.

Complainant here rested its case.

Defendant Colorado's Evidence.

OCTOBER 17, 1904.

2037 LOUIS G. CARPENTER, Denver, Colorado.

Direct examination.

By Mr. DAWSON:

My home is at Fort Collins, Colorado, but I am at present located in Denver, Colorado, and am the State engineer of the State of Colorado. I am a native of Michigan and am forty-three years old. I have filled the office of State engineer since the spring of 1903. Prior to assuming the duties of State engineer I was professor in the State agricultural college of this State and also in the agricultural experiment station at Fort Collins, in Larimer county, in the Poudre valley, in Colorado. I am still a director in that institution.

In response to your request to state fully what educational advantages I have had and what study I have given to the subject of irrigation, the use of waters and the reclamation of arid lands, I will say that I had the ordinary collegiate education, graduating at the Michigan Agricultural College in 1879 and doing post graduate work in both the University of Michigan at Ann Arbor and Johns Hopkins University of Baltimore. My studies there were along the lines of applied mathematics, physics, and fundamentally, upon the question or questions of exact measurement and the deduction of scientific laws. I studied also along the lines of engineering, and was a teacher of mathematics and engineering. That was the instruction which I gave for a number of years before I came to Colorado. I came to Colorado at the unsolicited invitation of the board in charge of the agricultural college of this State. I had previously become interested in irrigation. That was in 1884, from a brief visit to Colorado, and because of the opportunities connected with the position offered I took up the question of irrigation, which was to be
2038 the main subject of my work in this State. The chair which was given me in the college was that of irrigation engineer, and physics attached to it. That was the first chair of the kind in the United States; and in connection with that I had occasion to give the first instruction in irrigation engineering that was given in the United States, and developed the first course in that subject within a short time. In addition to the collegiate work was that of irrigation engineer of the experiment station, which had just been organized under act of Congress passed in 1888. This was tendered me in May or June of that year, so that the work of developing that line of investigation came in connection with my other work. As irrigation engineer of the experiment station the work in that line was of such a character as my own judgment impelled me to take up. It was largely a new field in this country, in fact entirely so. From that time to this I

have had charge of these lines of work. More lately, some six years ago, I think, in addition to the position as irrigation engineer, I was appointed director of the experiment station. That simply
2039 gave the added responsibility of giving general direction to the work of the station. The work of the experiment station is scientific investigation along lines important to agriculture. In this State the fundamental topic in agriculture is the question of water, and that means irrigation, and irrigation has been an important line of investigation in the work of the station and in my own individual work, and these investigations have been as ex-
2040 tensive as our means and facilities would permit. That did not mean that we went into extensive laboratories but we took that which was furnished by the conditions of the State. We took the canals and streams as we found them, and instead of building ditches and making laboratories for investigation we took those already constructed, costing hundreds of thousands of dollars, and measured and experimented on them. We have carried on measurements of the quantity of water used, of the manner in which the water was disposed of, the methods of measurement, the return or seepage waters, and this has been done now for fifteen years. For the last five or six years we have made measurements of hundreds of miles of rivers every year. Immediately after my gradua-
2041 tion I was appointed instructor in Michigan at the Agricultural college. Some of the work of the experiment station has been published in the form of bulletins. They are distributed widely throughout the State and to all who may apply for them. This is under the terms of an act of Congress, and they are
2042 published by authority of the Government; that is, they are authorized and required by the act of Congress which makes the appropriation for the experiment stations. Congress requires that the stations shall publish a certain number of reports each year, and that they shall be distributed freely. Each station is to a large extent independent, but the Department of Agriculture has a certain supervisory control over these stations and the bulletins that are published go officially to the Secretary of Agriculture or the Department of Agriculture, and to all other experiment stations. I have prepared bulletins on the Duty of Water, Seepage Investigation, Return Waters, The Relations of the Forests to the Water Supply, Evaporation, etc., possibly ten or more in all. There is an
2043 experiment station in each State and Territory. The one in Kansas is located at Manhattan in the valley of the Blue and Kaw, and the one in New Mexico is at Las Cruces. Among the bulletins which I have prepared in connection with my work at the experiment station at Fort Collins, treating of water or its duties, that have been most widely circulated, are Bulletin 13, on the Measurement of Water; Bulletin 22, on the Duty of Water; and Bul-
2044 letin 33, on Return Waters. These have all been quoted from and referred to by other writers. There is also bulletin 55. Bulletin 22 on the Duty of Water has been translated, or very

largely so, by the French Government. Bulletin 55 on Forests and Snow has been, I think, reprinted in this country, and its plates have been reprinted repeatedly; that is, they have been used in other journals and many quotations and summaries from them have appeared.

The General Government appropriates fifteen thousand dollars per annum for the experiment station at Fort Collins. That is used in agricultural experimentation, of which this work in irriga-
2045 tion is one of the lines. The State, through its agricultural college, uses more or less money to aid in this general work. In my position at the experiment station I was often called on by other persons living in this State and in other States and countries for information in regard to water, irrigation and the measurement of water and its use generally. In addition to the study of the subject of water referred to heretofore, I spent one summer in visiting portions of France that are under irrigation, and the northern portion of Italy, that is, Lombardy, Piedmont and Venetia, and I also visited Algeria in northern Africa. On these visits the French and Italian Governments did everything that could be done to
2046 make my visit profitable. I made this trip on my own motion, but had official letters from officials of Colorado and the United States, from the director of the United States Geological Survey, the Secretary of Agriculture, the Secretary of the Interior and the Secretary of State. If I remember rightly, I had a special appointment from one of the Secretaries, which was intended to give additional facilities and opportunities.

The interest which I had in water and irrigation problems was largely what led me to come to Colorado. I thought irrigation was an important line for this western country, one which must develop. That was largely the inducement which led me to come West.
2047 In my studies of the subject of water and its uses I have had occasion to become familiar with the Arkansas river and its drainage and in addition to this have studied the subject of irrigation with reference to all that part of the country which is dependant upon the use of water for irrigation. Most of the inquiries have been in the local field, that is, in Colorado. I have visited, however, nearly all of the Western States that irrigate or might be expected to irrigate, and my investigations have been on broad, general grounds, with a view to gathering such information as might be valuable in the treatment of any of the territory within the United States which might find it necessary to look to irrigation to make that country show its best results.

Referring to Defendant Colorado's Exhibit 3, I will state that this map was prepared in my office, from the official maps of the United States Land Office, with the exception of Texas. There is no
2048 public land in Texas belonging to the United States, and the portion shown there came from the State map of the State of Texas. It was prepared to show the drainage basin of the Arkansas river from its source to its mouth. It lacks a little of the area of

its water shed, that is, the portion covered by Missouri, because we did not have an official map of Missouri. So there is a little missing, which can be supplied. What drainage comes from the State of Missouri not shown on Exhibit 3 would come into the river far below either Kansas or Colorado through tributaries that are shown in part on the map, such as the Grand river, which enters the Arkansas river in the Indian Territory, and the White river in
2049 the eastern part of Arkansas. There are colors on the map which separate the upper Arkansas proper from the drainage of the Cimarron and also another color which separates the Cimarron from the Canadian. The Cimarron enters the Arkansas river in Oklahoma, possibly thirty miles south of the Kansas line. The Canadian enters the Arkansas river in the Indian Territory a little west of the line of the State of Arkansas. The Grand river enters the Arkansas from the north side in the Indian Territory, a little west of the Arkansas State line. The Grand and Verdigris come in nearly together. No part of the waters of the Grand, Cimarron or Canadian rivers reach the Arkansas until that river has passed through Colorado and Kansas.

The approximate drainage area of the Arkansas river in Colorado is 26,000 square miles, and in the State of Kansas 20,000 square
2050 miles. That excludes the portions of the Grand and Cimarron which enter the Arkansas below the Kansas State line.

The drainage of the Grand and Verdigris combined amounts to about 20,750 square miles; of the Cimarron 18,500 square miles; of the Canadian over 46,000 square miles. These latter areas are taken from the census reports. Combining all of these, the figures for the Arkansas river and its tributaries would show a total
2051 drainage area of 186,000 square miles, in round numbers. There is one large tributary near the mouth that is not given on the map, that has an area nearly as large as that of the Canadian. These drainage areas of the Arkansas river and its tributaries appear upon Defendant Colorado's Exhibit 3 in words and figures. Describing the Arkansas river, the whole of the river is shown on Defendant Colorado's Exhibit 3. The Canadian drainage and the Cimarron drainage are, as shown by the map, practically as important as the main river above their junction. The name "Arkansas" is applied to the northern branch of the three. It heads in the Rocky mountains, close to Leadville, and thence takes a generally southeasterly course until it reaches the exit from the mountains near Cañon City, thence a more easterly course through the State of Colorado and into Kansas. In Ford county it turns abruptly northeast to the vicinity of Great Bend in Barton county, and thence again to the southeast to Wichita in Sedgwick county, and then a more southerly course until it passes the Kansas
2052 line. The distance to the State line of Colorado from the source is 357 miles. To the point where it crosses the Kansas line leaving that State, it is close to 750 miles. These distances were obtained by going over the detail maps. They are stated from

memory, but are approximately correct. The head waters, being in the mountains, are then at a high elevation, as the mountains around Leadville are close to fourteen thousand feet high. The two extreme forks start from near Fremont pass and Tennessee pass. The latter pass is the one that the Denver and Rio Grande railroad goes through in crossing the continent. The amount of water shed as shown by the map is narrow but broadens as it reaches the plains. The tributaries include some in the extreme mountains, but the greater part are outside of the mountains. In the mountains near Leadville are Lake fork, Tennessee fork and the East Arkansas. As we pass down the river another lake fork or creek comes from Twin lakes and various other tributaries that flow in from one side or the other. The left hand or northern water shed in the mountains is narrow. The principal part of the river lands

2053 in the vicinity of Leadville are meadows, marsh and hay lands. The river falls with great rapidity for the first few miles, so that opposite Leadville, where it is very near the head, it has dropped to an elevation of nine thousand feet in about fifteen miles. It falls for that distance something like one hundred and fifty feet to the mile. From Leadville to Salida in Chaffee county, at the junction of the Little Arkansas, the valley is more or less open. It has some meadows and hay land. Below Salida it narrows up into a cañon or gorge with comparatively little land on either side of it. The area of the high water shed is relatively small. The area of land above timber line is small in proportion to the whole amount in the water shed. The Little Arkansas, coming from toward Marshall pass and entering near Salida, makes practically the last tributary of any importance of a mountain character. There are others, like Texas creek, Grape creek, etc., but these are not what might be termed entirely of mountain character. It is desirable to make a distinction between these streams. There is a very marked type of streams in the mountains. They are perennial in character, of rapid flow, supplied largely by springs and melting snows until late in the season. They are marked by freshests at the time of

2054 melting snow early in the season. Below the Little Arkansas to Cañon City the streams mostly lie at a lower elevation. The snow does not lie long on the ground nor remain late in the spring. They are supplied by melting snows in the spring and by mountain rain storms, but run dry, at least they do now. Such are Texas creek, Grape creek, Hardscrabble creek, Four-mile creek, the Fountain and the St. Charles. These streams all head in the mountains. Texas creek, Hardscrabble, Beaver, Four-mile or Oil creek, really enter before it passes out on the plains. They are of a transitional type, not perennial mountain streams, nor are they quite of the plains type. The distinction is important as showing the general character of the water supply. The Fountain, which enters the river at Pueblo from the north, drains the region near Pike's peak and then passes out on the plains and has for a great part of its course the typical plains character. The St. Charles, Apishipa,

Huerfano and Purgatoire are of the same character. They head in the mountains, and in the first part of their course are running
streams, and have the same characteristics as the upper
2055 Arkansas. Then they pass out of the mountains onto the
plains with a less rapid fall and a sandy bed. These streams then practically disappear and do not reach the main river. They sink. They have both the mountain character and the plains character. The largest part of the drainage is outside of the mountains, a relatively small part being in the mountain water shed.

Following down the river we then have a series of streams that are of the plains character; pure and simple; that is, they rise in the plains, their course is through the plains and they enter the river on the plains. This includes all of the streams below the Purgatoire. It also includes some above, short streams that head outside of the mountains, such as the Chico, Horse and Adobe creeks and any number of creeks that are called creeks but really are water courses or beds that streams do not often occupy.

Referring to Defendant Colorado's Exhibit 3, the designations on
the map do not all represent flowing streams. Many of these
2056 so-called streams are almost universally dry. Most of them
are simply depressions. They are often called gulches or arroyos. Locally a great many are called dry creeks. These streams would be more properly represented on such a map by dotted lines, which method is adopted on many Government maps. Some Government maps so show a part of the Arkansas river. All over Colorado we find innumerable creeks of this kind called "dry creek" or "sand creek."

At the present moment I cannot give definitely the drainage of the Arkansas river which lies in what might be called the high mountains. The area of the river above Cañon City is about three thousand square miles, but that includes all of the moderate elevations, from five thousand feet up. Generally speaking, the high area is small. I will furnish more accurate figures later.

Cañon City is about one hundred and fifty miles from the head of the stream, and Salida is about sixty miles west or up the stream from Cañon City. A large part of this intervening country is of a
moderate elevation and is a very dry country, a country
2057 which produces very little water except in times of storms.
It is rocky and the water that comes comes in freshets.

Texas creek and Grape creek are about the largest streams entering the Arkansas river between the mouth of the Little Arkansas river near Salida and Cañon City. (Objection.) They are not
streams which flow water constantly at the mouth. I know
2058 that in the upper part of Grape creek there is a great deal of
water, and ditches there. From the source of the Arkansas river the Tennessee Fork junction near Leadville is fifteen miles; to Twin Lakes creek thirty miles; to Salida eighty-one miles; to the Bessemer ditch head-gate one hundred and sixty-nine miles; to Cañon City one hundred and thirty-six miles; to Pueblo one hun-

dred and eighty-miles; to the Colorado canal two hundred and eight miles; to the Oxford Farmers' dam two hundred and fifteen miles; to the town of Rocky Ford two hundred
2059 and forty-eight miles; to the Fort Lyon canal two hundred and fifty-eight miles; to the mouth of the Purgatoire two hundred and eighty-six miles; to the Colorado-and-Kansas dam three hundred and nine miles; to the Amity canal three hundred and fourteen miles; to the Kansas-Colorado line three hundred and fifty-seven miles; to Coolidge three hundred and fifty-nine miles; to Syracuse three hundred and seventy-six miles; to Hartland four hundred miles; to Lakin four hundred and seven miles; to Garden City four hundred and thirty miles; to Dodge City four hundred and seventy-four miles; to Kinsley five hundred and twenty-one miles; to Great Bend five hundred and seventy miles; to Hutchinson six hundred and twenty-six miles; to Wichita six hundred and seventy-four miles; to Arkansas City seven hundred and thirty-four miles; to the Kansas-Oklahoma line seven hundred and forty-six miles. From Cañon City to the Colorado-Kansas line it is two hundred and twenty-one miles by river as near as we could determine from maps on the largest scale we had. These distances are not in a straight line, but are the actual lengths on the river as near as it could be ascertained.

2060 Referring to the fall of the Arkansas river, at its extreme head you can put the elevation at most anything from ten to fourteen thousand feet. Fremont pass is about eleven thousand feet, and Tennessee pass three thousand three hundred feet. From there down to the junction of the first forks the river has a fall of one hundred feet and over to the mile; from that point to Cañon City, at an elevation of 5,330 feet, it has a fall of fifty to thirty feet per mile; from there to Rocky Ford the river drops all together nearly twelve hundred feet, with a grade rapidly decreasing from Pueblo on. Down to Pueblo the grade is in the neighborhood of twenty feet per mile. From there to Rocky Ford it decreases to about seven feet to the mile. At Pueblo it has practically reached the plains rate of flow. From Rocky Ford to the State line the grade fluctuates from nine feet down to six feet per mile with a tendency to grow less as you go east. At the State line, with an elevation of 3,345 feet, the fall is probably between seven and eight feet per mile. At Garden City, at an elevation of 2,825 feet, the fall is between six and eight feet per mile; at Dodge City, elevation 2,465 feet, at Kinsley, 2,155 feet, at Great Bend, 1,840 feet, the fall between Dodge and Great Bend being nearly six and one half
2061 feet per mile for the whole distance. At Wichita, elevation 1,300 feet, the fall is less than five feet to the mile. At the Kansas-Oklahoma line the fall is just about four feet per mile. At Arkansas City the elevation is 1,040 feet, so that the Kansas-Oklahoma line is just about 1,000 feet elevation, and the fall is about three to four feet to the mile.

Referring to tributaries like Grape creek, Texas creek, Four-mile

or Oil creek, Beaver creek and Hadscrabble, which partake of the character of both the mountain and plains streams, they may be often flowing water for the first ten or fifteen or twenty miles of their
length from their source when they would be flowing no water
2062 on the lower reaches of the stream, though no interference
had been had with this stream. The streams known as the plains streams, those emptying into the Arkansas below the ones last named, which rise on the plains, a region of comparatively small rainfall, almost free from springs, are not as a rule running streams.
Their beds are sandy. The storms form practically their only
2063 source of supply and the water runs off immediately, so that
they are streams high in flood times and dry for nearly all the rest of the year. In flood they are often very wide and carry large amounts of water. They are violent, broad and rapid. The year's supply of water practically comes down in a few days or hours. After these floods run by they often leave the stream with a wide channel, so that so far as all the physical appearances of the stream are concerned it is a big river, except for water; that is, it has a broad bed. Speaking of precipitation, that in the Colorado water shed of the Arkansas river is not far from fourteen inches per annum, perhaps a little more. That is an average covering the whole
drainage area within the State for a series of years. It varies
2064 some at different points within the State, but not much. The
high mountain peaks have the heavier precipitation, but we have no records of any of them on this water shed except at the extreme elevation of Pike's peak. Some records have been taken in the vicinity of Leadville, but they have been exceedingly poor. I had occasion a few years ago to look up all the information that was available and came to the conclusiou that the precipitation in the greater part of the high water shed was very little more than at the foot hills. At Pike's peak for the first few years of the United States records the precipitation was a great deal more than during the last years. During the last ten or twelve years the precipitation has been almost the same or little above that of Colorado Springs and other adjacent points. The precipitation towards the east line of the State increases slightly. My conclusions as
to precipitation are based upon the voluntary observa-
2065 tions of the United States Weather Bureau, and volun-
tary observations reported to me. I have some twenty to fifty rain gauges scattered in different parts of the State. At some points in Colorado, such as Las Animas, observations have been carried on since early in the '70's, and a few of the forts kept early records. I cannot state as confidently the average precipitation in the drainage area of the Arkansas river in Kansas. We have made requests for data, all of which has not come to hand. In Dodge City, Kansas, for thirteen years the average precipitation has been twenty inches and a few hundredths. At the Colorado-Kansas line the average is not far from fourteen inches—possibly sixteen. At Wichita the average is something over thirty inches. From

there on south and east in Kansas it increases, so that it
2066 is nearly thirty-six inches at Arkansas City. The average precipitation in the Arkansas valley in Kansas is about twenty-five inches.

As the rainfall or precipitation increases the amount of run-off from such rainfall increases much more rapidly than the rainfall does. In explanation of this I would say that if the rainfall is small nearly all or all of it is taken up by the ground and evaporated. Any rainfall may be divided into that which is absorbed by the ground and that which runs off over the surface. Of that which is absorbed by the ground some will evaporate and some will disappear into the ground and subsequently form springs. If the rain comes in slow, gentle showers, it will nearly all be absorbed, but if it comes in a sudden, violent burst, a large part will run off and very little will sink into the ground. If the rainfall is small there is not enough to extend down to the lower levels and join with the water already there, but it simply moistens the surface. A rain of an inch in depth falling gently enough to be absorbed will saturate the ground to a depth of about five inches—about the ratio of
2067 one to five—and that is a very heavy rain as rains go in this region, for instance, where rainfalls are relatively slight, that is, fourteen or fifteen inches per annum. After the rain has passed away the sun and winds begin to act. The evaporation proceeds and the water that is within a moderate distance of the surface evaporates, and hence unless there is a heavy rain so that it soaks into the ground there is not enough soaking into the ground to form springs of any consequence. As you increase the rainfall the number of these heavy storms increases and the evaporation on the whole tends to decrease. The capacity of the air for moisture is less, and after satisfying the atmosphere there is a much larger surplus, and it is the surplus which runs off and forms the streams. Hence with a rainfall of thirty inches there would be a great deal more than twice as much run-off as with a rainfall of fifteen inches. Out of fifteen inches of rainfall there will be very little left after evaporation takes place to form streams; out of thirty inches of rainfall, not everything above fifteen inches but a great deal larger proportion—five or ten inches—will run off to the streams; while a rainfall of fifteen inches will leave probably less than one inch to form in the streams; therefore the supply of water increases very rapidly with the amount of rainfall.

2068 The Arkansas river partakes very much of the character of the intermediate streams which I have described, such as Grape creek, Texas creek, the Fountain, and the Purgatoire, in the fact that the upper reaches of the stream have constantly running water; then it runs out on the plains in a broad, sandy bed and the stream then tends to disappear, the same as the creeks above named and others of like character. This characteristic is commonly true of the streams along the mountains. The Platte is of the same

character, and also the Rio Grande. The Rio Grande has
2069 practically no tributaries after it reaches the plains. It has really but one, below Del Norte, in Colorado, although there are a good many that are fine running streams in the mountains, but as such streams reach the sandy bed, filled with sand and gravel for some feet, and with heavy evaporation, they grow less and frequently disappear. The Arkansas might then be appropriately called two rivers, or a broken river. We have the upper end a running river, the lower end a running river, and between these two living streams we have a portion that has been, from time immemorial, dry from time to time. In the absence of irrigation the upper river would begin to dwindle at its exit from the mountains. There are such tendencies now. There are portions of the stream, as at Pueblo, where it becomes less. Irrigation modifies this tendency to some extent, by the return water coming in from springs. The decrease is therefore most marked below Lamar, and in fact so far as our measurements have gone, more below Coolidge, and quite rapidly from there on. The lower stream I have not seen dry, so far as my limited experience has gone, below the mouth of the Little Arkansas river at Wichita. I have met in reading references to its being dry below there, but that has been the extreme point I have noticed.

2070 Without irrigation the Arkansas river would have a tendency to disappear and become dry between Lamar, Colorado, and Great Bend, Kansas, which would leave a stretch of about two hundred and seventy-five miles dry at times. There might of course be local conditions along this stretch of two hundred and seventy-five miles that would put more or less water in the river at times.

2071 Speaking of the character of the river bed itself, from Cañon City up it is of a mountain character, with a rigid stream, and with boulders and gravel, a bed rock showing at places and close to the surface at other places. From Pueblo east it takes the character of a sandy bed most of the way; that is, sand and gravel, the sand becoming finer as a whole as you go further east. The bed rock is not close to the surface except at places, as at Rocky Ford, from old Fort Lyon to the Amity dam. At some places in Kansas it appears as though rock should be near the surface, from the rocks on the side, but it does not appear. The river increases in width from Cañon City or Pueblo to about Coolidge, and for a distance of fifty or a hundred miles there the river bed from bank to bank remains at a broad width—practically a thousand feet; then from there on practically to Arkansas City there is a distinct tendency for the river to narrow up. This is shown in
2072 the cross sections of the river which we have had occasion to take. The banks almost all the way through Kansas are lower--three or four feet high—and also through Colorado below Pueblo. That is, we have a river bed with low banks, at first bottom, which generally is narrow—half a mile to very rarely much

more than that—these low banks extending all through Kansas in the natural state. At Wichita and other places the banks were built up. But the tendency of the river to disappear is shown by the dimensions given. Through Kansas the bed of the river is made up of sand of apparently great depth. At places the material deposited by the river in one way or another is of considerable depth, but how much we do not know. All along they have
2073 sunk wells eight to twenty feet, and we have records at other places, deeper. Throughout Kansas and along the Arkansas river and through part of Colorado we have long stretches of sand hills, sometimes becoming sand dunes. These prevail more on the south side of the river and often form a stretch of sand varying in width from two or three to a dozen miles. It consists of a fine sand that has been blown up and sametimes forms hills of considerable height. These hills are nearly always confined to the south side of the river. It is through these sand reaches from the Kansas-Colorado line to below Great Bend, Kansas, that great losses occur in the flow of the water in the river.

The Arkansas river differs from low land streams, those found in the humid regions, such as the Eastern States, in that its additions or its increase of supply from the country that it covers or goes through is relatively small. It has relatively few springs through a great part of its course from Pueblo down to about Great Bend, while a low land stream, or such as typify the eastern streams, is one constantly increasing in size as it goes. Such a stream has a great number of springs and a great number of tributaries which are simply a collection or a series of streams; and then in the bed it-
2074 self and along the banks it has constant accretions. That is not the case with the plains stream. Instead of increasing as the eastern streams do these streams of which the Arkansas river is a type become less in passing through this non-supplying country. The country is one of low rainfall and hence very little water runs in in that way. After you have passed down the Arkansas river until you have reached Hutchinson in Reno county, Kansas, a tributary enters which is practically the first tributary since leaving the mountains that is perennial. That is Cow creek. At Wichita on the north side comes in the Little Arkansas river, and Chisholm creek; on the south the Ninnescah; and from there on are tributaries all along. From Hutchinson back to Salida, Colorado, there is practically no perennial tributary. I think Walnut creek at Great Bend could scarcely be put in that class, though it may run some water nearly all the year. From Hutchinson down, the river assumes a new character and partakes more of the character of the ordinary streams as known in the Eastern and Middle States.
2075 I have made measurements and investigations which should throw light upon the tendency of the Arkansas river to lose water between the Colorado-Kansas line and Great Bend or some of the towns farther down. We have made these measurements of the river in Kansas during the past two years, keeping records of the

various places, and have traced down certain floods that passed the State line, and have kept a record of the height, and have also made measurements of the quantities of the water at different places. One such flood was followed in August, 1902, and there have been numerous ones in 1903 and 1904. For the past two years we have kept constant records of the stream at various selected points in Kansas. This consisted of a double system—first local observers who kept a daily record of the height of the water. That of
2076 course would give the height but not necessarily the quantity. Then in addition to that I have measured or have had measurements made from time to time of the river at different stages. When we had news of a particular flood we then followed it down. Very often we would make the measurements of a flood at a certain place, then take the train and go ahead and be at the next place before the flood, and thus make a series of measurements in determining the amount of water passing each place. We had gauging rods properly marked so that the height of the water could be determined and so that if they were interfered with it could be detected. It is the same system established and in use by this State for many years in keeping a record of rivers, and the same as that employed by the United States in their stream records. In several of these places in Kansas we had the same observers as the United States. We employed the same people for keeping the records.

2077 In interpreting these heights shown on the gauge rods, that is, in evaluating them in quantities—and that has been done at each of these places at different heights—we made rating curves, which are used simply as a means of putting the data in shape so that we could estimate the quantity of water at any intermediate height. In following these floods we ascertained about how long it took for them to travel between different points on the river, so that we could tell quite accurately where a given flood would be at a given time, though we could not tell this with certitude. (Objection.) In the August flood of 1904 the water arrived at Garden City, Kansas, within about fifteen minutes of the
2078 time we had predicted the day before. We were taking testimony in this case at Wichita at the time, and the arrival of the flood at Coolidge, Kansas, was reported to me there, and the prediction as to when it would reach Garden City was based upon that. The distance between Coolidge and Garden City is about seventy-two miles. This flood travelled at the rate of about two or
2079 three miles an hour. The rapidity with which the water in the river ordinarily flows is different at different points according to the fall. I cannot give that exactly now, but in Kansas it probably runs about two feet per second, and the fall varies from about seven to four feet per mile, and that would take off about a third or a quarter of the velocity of the flow.

Referring to the loss of water by the river, I will say that the river very rapidly decreases in its flow in the quantity of water, that

taking a given quantity of water at any of the places in western Kansas, that quantity very rapidly decreases. That has been
2080 shown by numerous measurements and by recent floods. I have two or three diagrams here of floods, that have been worked out and that show the changes in the flood heights and the flood quantities. Referring to the diagrams showing the floods of May and June on the Arkansas river—the first, marked Defendant Colorado's Exhibit 4, showing the flood of May 3rd, 1904, the next marked Defendant Colorado's Exhibit 5, showing the flood of June 1st, 1904, and the next, marked Defendant Colorado's Exhibit 6, showing the flood of June 2nd, 1904—these three diagrams are drawn in essentially the same manner, from the same data, and show essentially the same matter, except that they represent
2081 three different floods on the Arkansas river. The dotted lines that are drawn show the water and its quantity at different places along the river which are indicated at the side; that is, at Coolidge, Garden City, Dodge City, Kinsley, Great Bend, Hutchinson, Wichita and Arkansas City, in Kansas. The scale of the diagram is to the left, showing the number of cubic feet per second. The horizontal scale shows the day of the month. So that the combination of these two shows the change in the river at each of these eight places. The height of the line or the distance the line is from the bed indicates the quantity of water in the stream at the particular time indicated by the horizontal scale. If they were all measured from the same horizontal line at the bottom the lines at the different places which represent the flow would become confused, because one would fall on top of the other, hence to prevent that confusion the base line at each place from which the quantities are represented on the diagram is dropped down one square for each station going east. Thus the quantities at Coolidge are measured from a certain line approximately near the middle of the diagram; Garden City is measured from a line one square below, etc. Otherwise the lines would intermingle and become confused.

2082 Taking Defendant Colorado's Exhibit No. 4, this shows first at Coolidge, by the first and highest dotted or broken line, that the flood reached a quantity of ten thousand cubic feet per second of time on the latter part of May 3rd; that on the morning of May 4th it had dropped down to nine thousand; that during the afternoon of May 4th it had dropped to less than six thousand, on the morning of May 5th to a little over three thousand, and on the evening of May 5th to a little over one thousand; then it remained nearly stationary during the night and dropped down the next day to less than five hundred; then it rose on the 7th to nearly three thousand, dropped down again toward evening, and then remained at one or two hundred cubic feet per second of time from the afternoon of the seventh practically up to the twentieth and twenty-first; that in fact the flood itself had practically disappeared by the tenth, so that the flow then was practically nothing,—a hundred feet or less. Now, that is at Coolidge. A dotted line here

shows the corresponding data for Garden City that can be traced out correspondingly. You will notice that while the
2083 flood at Coolidge reached a maximum of ten thousand feet on the afternoon of May 3rd, the flood at Garden City was about 8,000 feet, this particular one first observed on May 5, and that likewise increased very rapidly and at Dodge City it reached the highest point or a little over 3,000 feet. The difference shown between the Garden City line and the Dodge City line would indicate that the river had decreased between these two places by the corresponding difference, and likewise at Kinsley, where the highest amount was 1,800 feet. At Great Bend it was about the same thing—about 2,000 feet. At Hutchinson it was slightly over 1,000 as the highest amount. At Wichita, it ran up to slightly over 1,000. At Arkansas City we then have those other streams—slight streams between—that brought it up to slightly above 2,000. That is the first May flood. Defendant Colorado's Exhibit 4, just explained, is characteristic of the other two, and the flood it represents
2084 may be called characteristic. It is one in which there was very little disturbance from rain along the line. The one marked Defendant Colorado's Exhibit 5 has some local rains that have caused some local rises below which can be seen on the diagram and are not due to the flood. Defendant Colorado Exhibit 6 is also a typical one. We have traced other floods besides the ones which these particular diagrams represent.

(Defendant Colorado's Exhibits 3, 4, 5, and 6, offered in evidence. Objection.)

These exhibits numbered 4, 5, and 6, were prepared by measurements made by me or under my direction and were drafted under my direction.

2085 The diagram marked Defendant Colorado's Exhibit 7 gives the widths of the bed of the Arkansas river at different places in Colorado. The data for this was obtained from our official records which are a little different in character in some different places. Most of these are made from actual measurements, and all of them are correct within a few feet and are arranged in the order of the river—the upper one is near the mountains and the
2086 lower ones farther down. At the gauging station at Cañon City the width of the river is 100 feet. At the Union Avenue bridge, at Pueblo, where our gauging station is located, it is 154 feet; at the bridge just below the mouth of the St. Charles river it is 300 feet; at the Oxford Farmers' ditch it is 420 feet: at the Otero bridge at La Junta it is 420 feet; at the Manzanola bridge it is 350 feet; at Swinck's bridge it is 355 feet; at the Fort Lyon dam it is 480 feet; at the La Junta bridge 556 feet; at Robinson bridge, 425 feet; at the Colorado-and-Kansas dam, 490 feet; at the Amity dam 504 feet; at the bridge at Lamar 850 feet, and at the Carlton bridge 800 feet. The diagram marked Defendant Colorado's Exhibit 8 shows the widths and cross sections of the Arkansas river in Kansas, also

the contour of the river bed, all prepared from actual meas-
2087 urements made with level and measured with tape during the summer of 1903. This diagram shows the widths at various points on the Arkansas river from Coolidge, Kansas, down. The scale is shown on all of these diagrams, and the left hand sides are placed very nearly in the same line vertically. At Coolidge the river's width is 1,485 feet; at Syracuse 780; at Garden City 980, with 200 feet of bridge beyond it; at Dodge City 550; at Kinsley 920; at Larned 500; at Great Bend a little over 700 feet; at Hutchinson 1,020 feet; at Wichita 500 feet, and at the Madison Avenue bridge, Arkansas City, 480 feet. The Wichita measurement was made just below the Douglas Avenue bridge.

(Defendant Colorado's Exhibits 7 and 8 offered in evidence).

2088 There are some terms used in the discussion of water and its uses in Colorado which might properly be defined, among which are "cubic foot," "cubic foot per second," "acre foot," and "inch," and their relations or ratios. A cubic foot is 1728 inches. It is the quantity which would be required to fill a box 1 foot cube. It is also equivalent to 7.48 gallons. For convenience it is usually satisfactory to take 7½ gallons. A cubic foot per second is a unit of a different kind. It represents a rate of flow, while the cubic foot is simply an absolute unit of quantity. A cubic foot per second would supply a cubic foot in one second and would fill a box
2089 one foot on a side in one second, or 7.48 gallons in one second, or 448 gallons in one minute. The cubic foot per second is the unit used in Colorado by law in stating the capacities of ditches and is the common unit used by engineers in expressing the flow of running water in streams or ditches. The term "inch" is sometimes spoken of as the "water inch" and is also used to express the quantity of water running in a stream or the rate of flow. It, however, is an indefinite unit. It takes into account simply the cross section of a ditch or stream without taking into account its speed, and is not an exact unit. The statutes of Colorado and some other States have attempted to define "inch" and have therefore given it a statutory meaning. In that case it is the amount of water that flows through a hole of a definite size and with a definite head, but the other conditions are varying. A cubic foot is approximately equal to 38 statutory inches in Colorado. In California it is 50, as fixed by statute. This unit is sometimes confounded with cubic inches. A cubic inch is a definite measurement of quantity while a water inch is intended to measure a rate
2090 of flow. But they are units of different character. So the flow of a water inch in a second would give approximately 45 cubic inches. "Acre foot" is also a unit of quantity. It does not involve the idea of time; it simply represents the amount of water that would be required to cover an acre one foot deep. It is therefore, 43,560 cubic feet. It is very often used in larger terms, as "ten acre feet." That expression would mean either water ten feet deep

over one acre or water one foot deep over ten acres. There is a simple relation between cubic foot per second of time and acre foot that is closely approximate; that is, one cubic foot per second flowing for 24 hours will give two acre feet; that is within less than one per cent., close enough for ordinary purposes. The term "acre foot" is found convenient in expressing the amont of water stored in reservoirs. Its value is as a unit of measurement, and to the people using it it represents at once approximately the number of irrigations that they may obtain from a given quantity of water. If you have ten acre feet it will be equivalent to enough water to
2091 irrigate 20 acres six inches deep. The other term, "cubic foot per second of time," is convenient because it expresses the size of a running stream, which, in taking water from ditches or streams, is important as enabling one to express the size of the stream which he is taking.

The term "seepage" as used in an irrigated country represents either the water that seeps into our out of a ditch—leakage. It is, the percolated water or waste water lost by the slow percolation of the water through the interstices of the soil that disappears in invisible sources from a ditch. That would be the water lost by seepage. The water that comes into a ditch by seepage would be the water that comes in in numerous fine channels in the soil or by percolation through the soil. They are not channels but simply an oozing out of the banks. The same is true as to streams.
2092 Seepage and drainage in a measure are the same. As to seepage water, we know its origin, that is, we know it comes from water supplied by irrigation. Seepage waters such as come from irrigated lands are similar for practical purposes to what might be called drainage waters from lands saturated to the same point by ordinary rainfall, but with us, when we use those terms, the universal application is to waters of this character put onto the ground, and the origin of them is easy to distinguish in this country because most of this region where seepage water is found was originally dry within the memory of man. The term "return waters" simply applies to these seepage waters as they come back to a stream, and the term has become quite well fixed in that regard. We take
2093 water out of a stream and spread it over the land for irrigation, and "return waters" means the percentage that returns to the stream, and it becomes quite a marked addition to the stream. The term "flood waters" is used to describe the sudden rises that occur in the more or less dry streams. It may be anything
2094 from a few inches flow to many feet.

In studying the Arkansas river and its history I have taken occasion to examine all of the historical works bearing upon the stream that I have access to in the library of the State of
2096 Colorado and elsewhere so far as available. (Objection.) These consist to some extent of Government reports by Government explorers and Government engineers and by other travellers. The character of these reports differ to some extent, depending

on the characteristics of the writers. Some were better observers than others. Some will note features which strike them and others those which impress them. The writers frequently refer to the river being practically dry at portions where they have struck it, which was generally on what was afterwards known as the Santa Fe trail, which struck the river near where Great Bend, Kansas, now is, and passed up along side the river to the neighborhood, I think, of Hartland, Kansas. One branch was still farther up. In that portion it is quite frequently the case that these writers and travellers have spoken of the river being dry or practically dry at the time when they were there, and have spoken of it as characteristic of the stream, as of other plains streams in the western part of the
2097 United States—that it was a common characteristic. The first explorer through there whose work I have consulted—and he was the first American to explore that region—was Major Zebulon M. Pike. He was major in the United States Army immediately after the purchase of Louisiana. Pike in 1805 was sent to explore the sources of the Mississippi, and in 1806 he was assigned to explore the sources of the Arkansas river, though that purpose was stated in a little different way. It was an important trip to the United States, in a new country. The Arkansas river was the boundary between the United States and the region to the south. He came up the stream in 1806 on a trip to determine the character of the boundary, its location, and a part of his instructions was that he should determine it so as to make it the basis of a convention with Spain. He was to ascertain the direction, the extent, etc., of the Arkansas river and the Red river. He struck the Arkansas river where Great Bend, Kansas, now is on October 17, 1806, and from there passed
2098 up the river to Pueblo, Colorado. His journal was in the form of a narrative, and he also sums it up in a letter to his commander and it was repeated by one of his lieutenants who was detached at Great Bend and went down the river. (Motion. I have Pike's report, and a reprint edited dy Doctor Elliot Coues, who has edited the works of a great many of these early western explorers. The original edition was the official report to the Government, and I have examined it as well as the edition of this report edited by Coues. The texts in the two seem to be identical. Coues has added notes, and I considered it the more valuable of the two. He has taken pains to identify many of the points which Pike
2099 described but for which he had no names. On page 427 of volume II of the book entitled "The Expedition of Zebulon M. Pike," edited by Elliot Coues, published by Francis B. Harper in New York in 1895, Pike's journal shows, October 18, 1806, the following relating to the Arkansas river:

"They informed us that the party was encamped on the Arkansaw, about three miles south of where we then were; this surprised us very much, as we had no conception of that river being so near. On our arrival we were met by Lieutenat Wilkinson, who, with all the party, was greatly concerned for our safety. The Arkansaw, on

the party's arrival, had not water in it six inches deep, and the stream was not more than twenty feet wide; but the rain of the two days covered all the bottom of the river, which in this place is four hundred and fifty yards from bank to bank. These are not more than four feet in height, bordered by a few cottonwood trees; on the north side is a low, swampy prairie; on the south, a sandy, sterile desert at a small distance."

2100 On page 517 of the same volume, in a general summary of his course, which he has written to General Wilkinson, who has given him instructions, he states as follows:

"The river at the place where I struck it is nearly five hundred yards wide from bank to bank, those banks not more than four feet high, thinly covered with cottonwood. The north side is swampy, low prairie, now identified as Cheyenne bottoms, and the south a sandy, sterile desert. Thence, about half way to the mountains, the country continued with low prairie hills, and scarcely any streams putting into the river; and on the bottom are many bare spots on which, when the sun is in the meridian, is congealed a species of salt sufficiently thick to be accumulated, but so strongly impregnated with nitric qualities as to render it unfit for use until purified."

The Cheyenne bottoms referred to in this quotation are a few miles from what is now Great Bend, Kansas. It has been proposed at times for a reservoir.

2101 Lieutenant Wilkinson was sent down the river and had thought Pike was lost. He therefore covered somewhat the same ground in his report. On page 546 of the volume last referred to he states:

"At daybreak (this was October 15, 1806) I was *I was* awakened by my old and faithful Osage, who informed me that we were on the banks of the Arkansaw river. I immediately arose, and discovered my tent to have been pitched on the margin of a water course nearly four hundred yards wide, with banks not three feet high and a stream of water running through it about twenty feet in width and not more than six or eight inches deep."

Lieutenant Wilkinson had been with a detached party that reached the river a day or two ahead of Pike. Coues, who was an army surgeon, in a note of his own, which he states was pencilled by him on June 3, 1864, describes the river thus on page 435 of the volume last referred to:

"Our route since leaving Larned has been mostly along the north bank of the Arkansaw. Queer river that—a great ditch, chock full of grassy islets stretching through the treeless prairie like a spotted snake, some seasons so dry you cannot wet your foot in it for miles, and have to dig for a drink, sometimes a raging flood two hundred yards wide."

2102 On page 520 of the same volume Pike describes the river as follows:

"It has one singularity which struck me very forcibly at first view, but which, on reflection, I am induced to believe is the same

case with all the rivers which run through a low, dry, sandy soil in warm climates, as I observed it to be the case with the Rio del Norte, viz: for the extent of four hundred or five hundred miles before you arrive near the mountains, the bed of the river is extensive and a perfect sand-bar, which at certain seasons is dry, or at least the water is standing in ponds not affording sufficient to procure a running course; but when you come nearer the mountains you find the river contracted, a gravelly bottom, and a deep, navigable stream. From these circumstances it is evident that the sandy soil imbibes all the (not evaporated) waters which the sources project from the mountains, and renders the river in dry seasons less navigable 500 than 200 miles from its source."

From my examination of this account of Lieutenant Pike's explorations, I am satisfied that where he refers to navigation it means navigation by canoes only, or buffalo boats, or buffalo skins. (Motion.)

2103 The original edition of Pike's explorations is entitled as follows. "An account of expeditions to the sources of the Mississippi and through the western parts of Louisiana, to the sources of the Arkansas, Kansas, La Platte and Pere Juan rivers, performed by the order of the Government of the United States * * * by Major Z. M. Pike," published at Philadelphia by C. and A. Conrad and Company in 1810, John Binns, printer.

I have also examined the publication of a book called "The History and Geography of the Mississippi Valley," by Timothy Flint, published at Cincinnati and Boston in 1833. At page 279 the author says:

2104 "The principal river of this Territory (Arkansas), whence it derives its name, and the next largest tributary of the Mississippi after the Missouri, is the Arkansas. The extent of this mighty stream is about 2,000 miles. In summer it pours a broad and deep stream from the mountains upon the arid, bare and sandy plains. The sand and the dry surrounding atmosphere so drink up the water, that in the dry season it may be crossed many hundred miles below the mountains, without wading as high as the knees."

I have also examined the work of Francis Parkman, called "The Oregon Trail." The edition I have here is that of 1892, published by Little, Brown & Co., at Boston, and illustrated by Frederick Remington. Parkman crossed the plains in 1846, and on coming down the Arkansas river he describes the general features of that river on page 349 at a point about three days' travel below Bent's fort, which would bring it close to Lamar, Colorado, as follows:

"The Arkansas at this point, and for several hundred miles below, is in August nothing but a broad bed over which glide a few scanty threads of water, now and then extending into wide shallows. At several places, during the autumn, the water sinks into the sand and disappears altogether. At this season, were it not for the numerous quicksands, the river might be forded almost anywhere without difficulty, though its channel is often a quarter of a mile

wide. Our horses jumped down the bank, and wading through the water, or galloping freely over the hard sand beds, soon reached the other side."

2105 On page 370 of the same volume he states as follows:

"Our tent was within a rod of the river, if the broad sand beds, with a scanty stream of water coursing here and there along their surface, deserve to be dignified with the name of river. The vast flat plains on either side were almost on a level with the sand beds, and they were bounded in the distance by low, monotonous hills, parallel to the course of the stream. All was one expanse of grass; there was no wood in view, except some trees and stunted bushes upon two islands which rose from the wet sands of the river."

I have also examined the writings of Louis H. Garrard, and a book entitled "Wah-to-yah and the Taos Trail," published in Cincinnati in 1850. Gar-ard was through here, apparently, in October 1846. On page 17 he states as follows:—

2106 "We reached the Grand Arkansas for noon camp; here quite broad, just above Cow creek,— * * * with two feet of water, sandy bottom and high sand buttes on either bank, as bare and cheerless as any misanthrope could wish. On the 13th Oct., we arrived at 'Pawnee rock.' * * *

"We awoke on the morning of the 16th, with a norther penetrating our blankets. The river Arkansas, almost dry, and on whose north bank we were encamped, was covered with floating particles of thin ice. On the 23d we came to the 'Cimarron' crossing of the Arkansas river.

"The river at the crossing was wide and but a few inches in depth, and a good ford. On October 31st we crossed 'Big Sand creek,' a large bed of sand one hundred yards in width, covered with water during very rainy seasons, but then dry. The Indians camped upon it a half day's journey from its mouth, where there is much water. Below that point the sand absorbs it. Our teams had to be coupled to get the wagons through the sinking mouth."

The Cow creek referred to is near Hutchinson, Kansas, and Pawnee rock is near Larned, Kansas. The Cimarron crossing was the crossing of the Santa Fe trail, the branch that passed southward directly to Santa Fe instead of coming up the river. It is about 20 miles above Dodge City, Kansas, as described by Captain Chittenden.

2107 The "Big Sand" creek referred to is evidently the "Big Sandy" creek as we now call it.

I have examined the report of First Lieutenant Beckwith, of the Third Artillery, U. S. Army, to the Secretary of War. He was connected with the Pacific railroad explorations. These were

2108 issued in three volumes in Washington in 1855. On July 16, 1853, he describes the river near what was then Fort Atkinson. On page 21 he states as follows:

"The river is unusually high, being from one hundred and fifty

to 200 yards wide; and the Indians in crossing it are occasionally seen swimming; while two years ago at this season, I am told by the officers of the army who were then there, that it was necessary to dig in the bed of the river for water to drink. This sinking of the stream during low stages of water is not peculiar to the Arkansas, as is well known, and it is believed the water can always be found in abundance by digging in the bed of the stream."

I have examined the volume of Edward Everett Hale entitled "Kansas and Nebraska," published at Boston by Phillips, Sampson, & Co., in 1854. On pages 112 and 113 of the copy which is in the Morgan collection in the capitol building at Denver, he states as follows:

2109 "The lower part of the valley of the Arkansas is, as is well known, a rich and fertile country. That part of its valley, however, which lies in Kansas, is not well-wooded, though fertile farms have been established in the immediate vicinity of the river, it does not appear to be in general a promising agricultural region. In the neighborhood of the Pueblo tall woods line the river with green meadows on either side. The crops raised there are abundant. At Bent's fort there is but little timber. Timber sometimes appears in small sections; but in general for several hundred miles the river is most of the year a broad sand bed, over which a few threads of water glide along, occasionally expanding into wide shallows. In the autumn the water sometimes sinks into the sands and disappears altogether. At the 'Big timbers,' about thirty-five miles below Bent's fort, the river widens, and the banks on each side fall towards it in gentle slopes. The 'timber' is a thinly scattered growth of large cottonwoods, not more than three-fourths of a mile wide and three or four miles long. 'The bed of the river,' says Col. Emory, 'is seldom more than 150 yards wide, and, but for the quicksands, is everywhere fordable.'"

On page 114 he says:

"The narrow strip which I have described as the bottom lands of the Arkansas, varying half a mile to two or three miles wide, contains a luxuriant growth of grasses, which by the judicious selection and distribution of the camps sustained all the animals of the Army of the West whilst on the river."

2110 I have examined the work of W. W. Davis, late United States attorney, entitled "El Gringo; or New Mexico and Her People," published in New York by Harper & Brothers

2111 in 1857. He evidently crossed the plains in 1853, and in speaking of the Arkansas river at old Fort Atkinson, which must have been close to where Fort Dodge was afterwards located, about 70 miles west of Pawnee Rock, on page 32, referring to December, 1853, he says:

"We did not leave camp until ten o'clock the next day, and then continued our journey up the east bank of the Arkansas. The river here is not more than three hundred yards wide, with low banks, and filled with numerous beds of sand. The water is very shallow,

clear, and pleasant to the taste, but in regard to navigation, there is no hope of its ever being able to bear upon its bosom a larger craft than an Indian canoe."

* * * * * * *

"We passed old Fort Atkinson, now in ruins, and halted a few miles beyond to dine."

2112 · I have also examined a work by Lieutenant Colonel Richard Irving Dodge entitled "Plains of the Great West and Their Inhabitants," a description of the plains, game, Indians, etc., of the great North American desert, published at New York in 1877 by G. T. Putnam's Sons. On page 22 he describes the peculiarities of the Arkansas and of the rivers of this type in the West. He has been speaking of the Arkansas, the Canadian, the Cimarron, etc. On this page he says:

"One of the most striking peculiarities of these rivers is that they rise downward. In April the Arkansas at Fort Dodge is a sandy bed, a fourth of a mile in width, with possibly an average of three or four inches of water. In June when the mountains send forth their flood of melted snow, the river swells, the current increases in power, and washes out long channels in the sandy bed. When the banks show a rise of two feet, the water has cut channels in the sand five or six feet deep, and covering probably a full third of the distance from bank to bank. At these times the current may be said to be a huge wave of sand, surging, rolling, turning and shifting with incessant activity. Where there is six feet of water in the morning, there may by noon be a bar with but an inch. By night the bar may be gone and a deep channel in its place. These channels are from ten to thirty feet wide, with generally perpendicular sides. Some force will set a current in a particular direction across a bar. In a few minutes a channel from three to six feet is cut, through which the water pours as in a mill race."

2113 And on page 28 of the same volume:

"As the gorges widen the timber grows more and more scarce, and by the time the stream arrives at the third plain, there is scarcely a tree or even a shrub to be found on its banks. The Platte, the Arkansas, and the Cimarron, filter their waters for hundreds of miles through the sands of their shallow beds, without a tree to give life and variety to the scene."

And on page 34, same work:

"The south bank of the Arkansas is bounded by these hills (that is, sand hills) for more than three hundred miles. The white sand bed of the river itself is in many places perfectly dry for a month or more of each year. The prevailing winds, during the summer and fall—the dry season—are from the south-west; yet, however much the form and position of the sand-hills on the south side of the river may change, there is scarcely a particle of sand to be found on the north bank, nor a single sand-dune formed outside of what can readily be distinguished as the old limits or boundaries of the

sand-stream. Just opposite Fort Dodge this stream narrows in one place to a few yards."

Colonel Dodge is describing what he terms the "sand
2114 stream," which refers to the sand dunes. He says on page 35:

"Twenty-five miles below Fort Dodge the Arkansas bends to the northeast; the sand-stream attempts to follow, but, apparently unable to turn so sharply, compromises the matter by keeping near the river with the northern edge, while the south edge stretches in nearly a straight line to the east in continuation of its former course. The consequence is, that the sand-stream becomes nearly forty miles wide, and so extremely difficult to cross with loaded waggons, that buffalo-hunters, and other people of that section, prefer to turn it by the longer road, via Fort Dodge."

I have examined some of the papers of Kansas and have before me a copy of the "Ford County Globe," published at Dodge City, Kansas, July 22, 1879. This publication is in the library of the State Historical Society at Topeka, Kansas. It comments on the Arkansas river in an article headed "High and Low Tides," and states:

2115 "The river presented a series of unusually interesting phenomena during the present week. First it suddenly dried up and remained so for some 24 hours, when lo! it as suddenly assumed its normal condition. Again it dried up, and at the moment we pen this, it is to be found in that condition. Thousands of fish were caught in nets improvised for the occasion, which had become land locked in little pools on the bars, and thousands died in the intense heat engendered in their limited quarters."

I have examined some of the writings of B. B. Smythe in a paper called "The Age of Kansas," in the "Transactions of the Kansas Academy of Science," volume IX, 1883–4. On page 130, it states:

"In winter, when north winds prevail, the Arkansas is dry, and the wind blows considerable sand out of the bed of the river and makes ranges of sand-hills all along the south of the river. In summer, when the prevailing winds are south, the river is filled with water and no sand is blown out. From Hutchinson to Arkansas City, over which course the river runs nearly south and is seldom dry, there are no sand-hills."

I have examined the report of the United States Secretary of the Interior. It is a report made in compliance with a resolu-
2116 tion of the United States Senate in 1889. The report is in "Senate and Executive Documents," and is Senate executive document 120, volume III, 50th Congress, second session. The resolution in answer to which this report was made directed the Secretary of the Interior to inquire and report to the Senate at its next session the extent to which the diversion of the waters of the Platte and the Arkansas and their tributaries in Colorado for irrigation and other purposes affected the flow, and especially in the

growing season, etc., and whether in his opinion the title conveyed by the Government to lands fronting on said streams covered the privilege of irrigation. The report is made by the Secretary of the Interior, and it was prepared by J. W. Powell, who was chief of the Geological Survey. It enters into a description of the rivers, and on page 5, in his report to the Senate, he states in part as follows:

2117 "The waters of the Arkansas cannot be taken out within the boundaries of the State of Kansas and stored in reservoirs, from the fact that they contain so much silt that the reservoirs would be speedily obliterated. The flow of waters in the irrigating season is already provided for. All additional irrigation from these waters would be so small that all State interests may be neglected."

Then further along, in speaking of evaporation:

"The prospects for irrigation in western Kansas depends on the storage of water in Colorado."

And further on:

"But experience in California, in Utah, in Colorado, and on the Gila in Arizona, abundantly exhibits the fact that the waters used in irrigation are but partially evaporated, and that a very large quantity finds its way again to the streams. It is thus that the facts of experience have modified preconceived hypotheses."

And on page 6 as follows:

"It must be remembered that the upper Arkansas, the North Platte and the South Platte are not navigable streams * * * They are thin sheets of mud tumbling down a highly-inclined plane, so that the interests of navigation are in no way affected by the use of these streams for agriculture. * * * From the above statement it will appear that the question of the use of the Platte rivers and the Arkansas is one affecting agriculture only, and that the amount of irrigable lands redeemed in Nebraska and Kansas by the waters of the Platte and Arkansas depends upon the amount of water stored in Colorado and Wyoming."

A little earlier in his report, on page 2, he states:

2118 "The Platte and the Arkansas have their sources in the mountains of Colorado and Wyoming, but after passing the Colorado and Wyoming lines they receive great additions to their volumes from the storm and streams of the lower country; so that but a small portion of the water which these rivers discharge * * * comes from the mountain regions."

In 1819 was the expedition of Major S. H. Long, after whom Long's peak is named. He went up the Platte, struck the Arkansas river near what is now Cañon City, Colorado, and thence passed down the river, reaching Great Bend, Kansas, on August 10, 1820. He has several references to the river in his report, the title of which is "Account of An Expedition from Pittsburg to the Rocky Mountains, Performed in 1819 and 1820, by Order of Honorable J. C. Calhoun, Secretary of War." This report is compiled by Edwin

James, botanist and geologist of the expedition, published in
2119 Philadelphia by H. C. Carey and I. Lea in 1823. On page 50 of volume II, July 18, 1820, at a point apparently close to the present Cañon City, he stated:

"The Arkansas, from the mountains to the place of our encampment, has an average breadth of about sixty yards; it is from three to five feet deep, and the current rapid. At the mountains the water was transparent and pure, but soon after entering the plains it becomes turbid and brackish."

On page 66–'7, written on the 23d of the same month, at a point apparently near the mouth of the Purgatoire he states:

"The Arkansa, between this point and the mountains, has a rapid current whose velocity, probably, varies from four to six miles per hour. It may be forded at many places, in a moderate stage of water. The average breadth of the river is from sixty to seventy-five yards. At many places, however, it is much enlarged, including numerous islands. It pursues a remarkable serpentine course within its valley, forming a succession of points on both sides of the river, which, together with the islands, are usually covered with cottonwood. The bed of river is gravel, or composed of water-worn stones, which diminish in size as you recede from the mountains."

2120 Then on page 258, which seems to have been on September 9th of the same year, he comments on the general character of the Arkansas as follows:

"The Arkansa, below the Great Bend, becomes more serpentine than it is above, and very much obstructed by sand-bars and islands, either naked or clothed with a recent vegetation; they are but little elevated above the surface of the water, and are covered, to some depth, during the prevalence of floods in the river.

And a little later on, on the same page:

"The current of the Arkansa is much less rapid than that of the Platte, but the character of those two rivers in a considerable degree corresponds in their widely spreading waters of but little depth, running over a bed of yielding sand."

This work may be found in the Congressional Library at Washington, together with rare maps.

I have also examined a record of the trip made by Jacob Fowler in 1821 and 1822. He was apparently an early trapper and passed up the river from Fort Smith, Arkansas, to what is now Pueblo, Colorado. He started from Fort Smith in September, 1821, and reached Great Bend on the 19th of October, almost exactly 15 years later than Pike. His diary has been found and printed by
2121 Francis P. Harper of New York in 1898. The title is "The Journal of Jacob Fowler, narrating an adventure from Arkansas through the Indian Territory, Oklahoma, Kansas, Colorado, and New Mexico, to the sources of the Rio Grande del Norte," edited with notes by Elliot Coues, who edited Pike. Fowler was apparently not an educated man, but one of good observation. Commenting

on the river between Hutchison and Great Bend in Kansas, near the same place of Pike's comment of 15 years before, on page 21—he has been speaking of the hills—he says:

"the River—Which is from two to 400 yds Wide—With large Sand bars and low Islands this is its general Caracter as fare as We Have seen it."

2122 And then later on he comments on the fact that there is no timber on the banks of the river, none at all except on the islands, which I think indicates that the fires, which were prevalent, had kept down the timber except where protected by the water or the sand bars.

2123 I have examined the work of Captain H. M. Chittendon of the United States Army, entitled "The History of the American Fur Trade of the Far West," published by Francis P. Harper in 1902 in three volumes. He refers to the Arkansas river in the course of his history in several places. On page 537 he is describing the various points on the Santa Fe trail and in speaking of the Arkansas river he says:

"This stream which for all its length west of the 100th meridian was the frontier between the United States and Spanish territories, was one of great importance to the traders of this region. It was not a navigable stream in this part of its course, unless the possibilities of descending it in light craft in flood time entitles it to that distinction. Its importance arose in part from the fact of its being the national frontier and in part because the country about its head waters was a rich trapping territory."

2124 On page 775 of the same volume he speaks of the characteristics of these streams of the plains and of the Arkansas river under the heading "Plains Rivers." He describes what he terms two characteristic streams of the arid region—the Arkansas and its tributaries and the Rio Grande—as follows:

"The most striking characteristics of the plains streams are their great length and comparatively small drainage area. The Canadian branch of the Arkansas, for example, through the five hundred miles of its course, has a water shed which averages scarcely fifty miles wide. The same is true of the North Canadian and the Cimarron. Even in a humid climate these streams would be small in comparison to their length. In a region where rain rarely falls most of them are totally dry for considerable distances and long periods. The water which flows from the mountains is not sufficient to overcome the seepage and evaporation on the plains in the dry season, and even the main Arkansas is a very small stream in its course through western Kansas and eastern Colorado. The Arkansas is the best type of the plains streams, as well as the most important in that section of the country. It was often spoken of in early times as 'The River of the Plains.' Only that portion which lies above the mouth of the Canadian is of interest in connection with the fur trade. Below this point the river enters the humid belt and takes its character almost entirely from the local drainage. In fact if the

upper two-thirds of its course were wiped out of existence, the difference could scarcely be noted at the mouth of the stream."

2125 In the letter from the Secretary of the Interior heretofore referred to, transmitting the response to the Senate resolution of August 29, 1888, "The effect upon certain rivers in Colorado of the diversion of water for irrigation," on page 3 of this document the Secretary of the Interior states, in speaking of the South Platte and the Arkansas, as follows:

2126 "* * * whether the agricultural industries along the Platte and its tributaries in Colorado should be destroyed in order that new industries in Nebraska may be created, is a question that everyone can easily answer for himself. But there is a further condition worthy of consideration. If the waters of the South Platte now used in Colorado were used in Nebraska, the area brought under cultivation in the last State would be very much smaller than the area now under cultivation in Colorado by the use of the same waters. This fact results from well-known physical conditions. In that arid region the rain is condensed in the mountains; comparatively little falls on the arid plains, not enough to produce perennial streams. When the waters debouch from the mountains into the plains their channels are radically changed; they are narrow, deep and clear. Where they run across the plains they are wide and shallow, and their waters are loaded with mud. The muddy waters are spread out below in wide channels of sand. A stream may be several hundred yards wide and only a few inches deep. The waters permeate these sands, and a large portion is evaporated; so that a stream steadily diminishes in volume from the mountains across the arid plains until a more humid region is reached, where it again increases in size. It is for this reason that the waters of the South Platte will irrigate a much larger area in Colorado near the mountains than in Colorado near the Nebraska line; and the area which they will irrigate in Nebraska is still smaller. It is probable that three acres can be irrigated near to the mountains of Colorado where only one acre can be irrigated in Nebraska."

The same conditions referred to in this quotation as existing on the Platte and the conclusions drawn from them would be justified in reference to the Arkansas river. Here is another statement from page 4 of the same volume:

2127 "But when the mountain waters of the non-irrigating season are stored in this manner and poured upon the lands of Colorado and used for agricultural purposes, a part of this stored water will be evaporated to the heavens, but another part—and a large part—will be returned to the Platte, where it can be recovered and again carried to the irrigable lands farther down the stream in eastern Colorado and western Nebraska."

which would equally well apply to the Arkansas river, for the two streams are of practically the same character, as Colonel Dodge and others have said.

The citations which I have given of historical references to the

river, and the passages quoted, were chosen because they bore most directly on the peculiarities of this stream and especially on the peculiarity of the dry stretch extending through eastern Colorado and western Kansas, and included the principal early references that I came across relating to the width and quantity of the water as mentioned by early travellers prior to irrigation and show-
2129 ing that it was essentially the same as at the present day. From the records of the river kept at Cañon City for about 16 years I can state that the average flow of the river at that point is about 750 cubic feet per second of time, and this includes
2130 high water, low water and everything. Now, from Cañon City practically to the State line the original condition of the river has been modified by the water which is taken out on the adjacent plains, so that for that portion of the river from Cañon City to Lamar the river gains by springs or seepage which comes from irrigation. It is therefore not losing water to any great extent at present through this section, although there is every reason to think that were it not for irrigation the river would be losing throughout that distance. From Coolidge, near the Kansas-Colorado State line, eastward, the river loses nearly constantly. Some of our measurements have shown that the river loses from Lamar to the State line, and they have generally shown a loss under present conditions from Pueblo for a distance east of about 30 miles. But considering for a moment that the water which passes Cañon City should reach either Lamar or Coolidge, then the loss to be considered would be and is at present from Coolidge east. An estimate of that loss at this time would be provisional. We have measured a number of different floods. I have measured the flood of 1902. At Dodge City, Kansas, I found the flood was
2131 5,701 cubic feet per second of time. At Hutchinson, Kansas, it had decreased to 2500 cubic feet per second of time; at Wichita to 2,010, and at Arkansas City to 1,193 cubic feet per second of time. In the four floods of May and June of this year which were measured we found the loss from Coolidge to Garden City was remarkably uniform. They were not interfered with by rains. In one flood the amount of water which passed Coolidge was decreased by the time it reached Garden City so that 59 per cent. was all that was left; 41 per cent. had been lost. In another flood 49 per cent. was lost. In the other two there were respectively 45 and 47 per cent. lost. The distance between Coolidge and Garden City where this loss occurred was about 60 miles. In the stretch between Gar-
den City and Dodge City two of the floods gained and two
2132 lost. This was because of interference from storms, the effect of which is shown on Defendant Colorado's Exhibits 4, 5 and 6. From this data, which is not all complete, I should therefore make the provisional estimate that not over thirty per cent. of the water which should pass Cañon City or Lamar would reach to the vicinity of Wichita, Kansas. This takes the river as it is, but does not exclude or allow for tributaries that come in. In other words,

if you had a certain amount of water at Lamar or Coolidge, not over thirty per cent. of that would reach Wichita, even with the addition of springs which might be along the course—the invisible sources—

but it does not include streams like the Walnut and Cow
2133 creek. They are excluded. If they were included of course the stream might be more than thirty per cent. of that above. I do not mean to say by this that if you were to cut off all tributaries of the river below Cañon City and exhaust the water from the ground and then turn loose the average flow of 760 cubic feet thirty per cent., or necessarily any of it, would reach Wichita. (Objection.) In saying that thirty per cent. of the amount passing Cañon City would reach Wichita, I allow for the advantages of con-

veyance which it would have by reason of other sources
2134 which would keep the stream in condition to carry it, and I think this estimate of the amount which would reach Wichita is a high one. I make it high purposely. Later, I want to add to this the results of a comparison of measurements which are being reduced and which would take a great deal of labor. In making these estimates I have taken Cañon City as the point where we had definite measurements, and have allowed that whatever water passed Cañon City would arrive at the Colorado-Kansas line undiminished, and the loss which I speak of would occur after the river passes that line. (Objection.) In fixing this percentage of loss I have been taking the stream as it is and not as it would be if there were no tributaries or no water coming in from the soil. If this latter condition existed the water that passes Cañon City would probably not get into Kansas at all. (Objection.) It is well known that the loss in canals is large, even with a confined bed, and that a head of water of considerable size is needed to carry water through a canal. This would be much more true in case of a sandy river. The estimate of loss made by Major Powell in the quotations heretofore given is even larger than that made by myself. He has supposed or estimated that only one-third of the water would reach from the mountains out to the Nebraska line. My statement of the amount of water passing down the stream is a maximum amount; and this fact that water is lost justifies the statement of Major Powell that more land can be irrigated near the mountains or source of a stream than farther out on the plains. Below Cañon

City a considerable part of the country is under irrigation to
2135 the Colorado-Kansas line. Assuming that the average flow of the river at Cañon City is 750 cubic feet per second of time and that only thirty per cent. of that amount of water would reach Wichita, and assuming that the river at Wichita is 500 feet wide, such amount of water would raise the river at Wichita not more than 2 inches, and if the river were a thousand feet wide at Wichita, as many witnesses said it formerly was, then this amount of water would raise the stream at that point only about half as much, or one inch.

2136 Speaking of the character of the country drained by the Arkansas river, I would say that the river leaves the mountains at a little less than 6,000 feet elevation. Between the elevation of about 7,000 and 11,500 feet, a large part of the drainage area was originally forested. From 11,500 feet elevation to 14,000 feet, the summit of the highest peaks. there was no forest, it being above timber line. Within the limits between 7,000 and 11,500 feet, the forest on the Arkansas river was partly evergreen, partly quaking asp, and some of the mountain parks were free from timber. In the water shed of this river there seems to have been a larger percentage of bare country than on the headwaters of the Platte. Hayden attempted, in a map made from his survey of Colorado in the '70's, to give the forested area, and he shows quite a large percentage of mountain park country free from timber in those days. The amount of timber has since decreased materially. Throughout the headwaters of all of these streams the affect of the ax and of the

2137 fire is seen upon every hand. The mines have had the privilege of cutting the timber for mining purposes and they have swallowed up the forests to a great extent, but the fires have caused even greater damage. In some places like Tennessee pass the fires which raged there 20 or more years ago have left the country bare and it has not recovered from it. I have made attempts to get the amount of timber that is now present and have inquired of apparently all available sources—through the forestry department, investigations under my own direction, and otherwise. The governments stated that they had no data by which they could answer the question. Mr. Enos Mills has made trips through the mountain region for the past two winters on investigations in connection with the experiment station and also with the engineer's office, and I have especially asked him to observe the forests and get an estimate as to the percentage there might be remaining. I made similar inquiries of Michelsen, forestry representative in this State. From the best information I could obtain it would seem there is not 20 per cent. of the original forests now remaining, and that which remains is

2138 largely the smaller timber. I have made some investigations for a number of years of the relation between the forests and our run-off of water, and these have taken the line partly of examining the preservative effect of the forests upon the snow. I have kept for a dozen years or more a self recording instrument at the mouth of the Poudre river at its exit from the mountains that has registered night and day the fluctuations of the water in that stream. A study of those records has shown the close relation between the forests and the melting snow in the behavior of the stream. I made some investigations some years since, carrying them through several years. I have taken photographs or caused them to be taken

2139 of the snow in the mountain areas or the timbered areas. We made special trips back into the remote mountains for the purpose of getting that data. The result of these investigations was published in bulletin No. 55 of the experiment station of

Ft. Collins. Photographs were issued as cuts. Photographs from the same spot looking into timber and looking into a region that had been burned were printed. They were intended to be printed opposite to each other, side by side, but through an error of the printer the form was made up so that they do not come opposite. Thus plate I and plate II of bulletin 55 are two pictures taken from the same spot on the same day and hour, one looking into timber, showing the snow that is preserved by the timber, and the other looking into the barren region as free from snow as the country below. Those were taken on June 21, 1899. There are other sets through the same bulletin taken in the same manner. The other diagrams in the bulletin shown show the diurnal change in the stream, its diurnal fluctuation—the diurnal tide—of the water as it rises, due to the increased melting during the daylight hours
2140 and the checking of the melting during the night. It was most notic-able as regards the protective influence of the forests, and the effect of a cloudy day, which was analogous to the effect of forests. A rainy day in the mountains had the effect of decreasing the stream instead of increasing it as was anticipated. That is, an ordinary rainy day. Not an ordinary storm, but one that was connected with cloudiness throughout the day and where a moderate rain fell. The reason as developed is that the protection afforded by the clouds from the heat of the sun and the consequent decrease in melting decreased the water supply from that source so that the decrease was greater than the increase of water supply from the rain. The forest has the same effect as the cloudy day. It is noticed in going through the higher elevations that in the late spring or early summer when the snow is found in places it is found in the protection of the trees and not in the open. In July of this year I noticed a case where the shadow of a log had fallen on a snow bank and the snow there was perhaps three feet deep, just a
2141 ridge of snow, protected by the shadow. You will find that the snow banks at that season at elevations of 10,000 feet are entirely in the timber. Where the timber has burned off or has been destroyed in other ways there is no snow; it is absolutely dry and generally hard, and hence the protection of the forest has a very great effect, I think, upon our water supply and upon its character; that is, as the forest diminishes its protective influence is gone and the snow is melted more rapidly. It fails to enter the ground and the water comes down in violent rushes and the springs are dry and the tendency is for the stream to come in floods and torrents instead of the perennial and constant flow. That I think is the conclusion that almost every one who has watched the forests and their relations to our streams has come to. The thickets which formerly were along the channels of the stream down to a low elevation maintained the snow and ice until late in the spring and the streams which the earlier settlers found were running late in the spring. They now have very little in them, even in the midst of winter, so that streams like

the Arkansas have as a rule very little snow along their
2142 channels until we get clear to their head waters. Even on the main stream itself along the region passed by the railroad it is very frequently the case that there is no snow at the elevation of the railroad, about ten thousand feet, though it can be seen on higher elevations almost any time. The forest protects the snow from the wind. In one respect this is as important as from the sun. The protection from the sun prevents the snow from melting. The protection from the wind protects it from evaporation. I have carried on measurements on evaporation for fifteen or sixteen years, including the winter, and we find that the evaporation from the surface of solid ice runs from one inch to one and a half inches per month. The evaporation from snow is very much greater because the wind passes into the interstices of the particles of snow
2143 and attacks them on all sides. How much greater its evaporation is I am not prepared to give in definite measurements. Now, where winds have a chance to strike the snow it disappears very rapidly. The old settlers say the wind simply wears out the snow. That is another way of expressing the fact that the wind evaporates it. Hence the protective influence of the forest in preventing the excessive wind is a very important factor in preserving our water supply. The protection from the sun would only change the character of the flow, that is, as to whether there were floods or not. The excess of wind would mean an actual loss of water supply. The snow would evaporate and then would not appear in the streams at all. We have had a number of marked cases where snow has been a number of inches deep at one time and has disappeared within a short period without even wetting the ground, purely by evaporation. Naturally, with the absence of timber, this effect has very much increased. We have a corresponding effect from an analagous cause on the lower foot hills and on the plains that has increased during the past few years since settlement has become greater and since the grazing of the plains and the
2144 foot hills by stock. It is now very rarely that snow lies upon the ground for any length of time in this section. The grass that formerly either stood with its stocks up in the air and thus formed small wind breaks—small individually—would as a whole cause a great break of the wind and really add quite an influence in protecting the snow from the blowing of the wind; also the matty covering of grass which fell down upon the plains and foot hills and elsewhere, even where unprotected by forests, was an insulation as well from the heat of the ground as the heat of the sun and force of the wind. The heat of the ground then did not serve to melt the snow as it does when falling directly upon the ground, which is the case at present, because most of our plains and the lower mountains have very largely been denuded of that covering of grass which was formerly a protection in this way and also a protection from the erosive effects of storms.

Both the Fountain and the Purgatoire were originally very nar-

row streams; now they are hundreds of feet wide. The Chico
2145 has cut a deep channel into the plains. A great many little channels east of Pueblo that are now ten, fifteen or twenty feet deep, with vertical sides, cutting up the plains into a great many sections difficult to cross, were not of that character in the early times. They were not channels at all, simply depressions. These are some of the changes that have taken place due to the denudation of the forests and the grazing of the grasses, both of which were protective in the manner described. These things have all had an effect in modifying the flow of the Arkansas river. In the forest areas particularly the cutting of the forest has not only changed the character but has decreased the flow because of the wind effect—that is, by permitting the snow to evaporate. On the plains I am not so sure as to the sum of all these influences—that is, as to whether it has so decreased the total quantity—but it certainly has changed the character of the water supply of the plains.
2146 In the mountain areas these changes have decreased the average flow of the stream and also the minimum flow; that is, they have decreased the maximum and correspondingly decreased the minimum. On the plains the tendency is to increase the maximum and to decrease the minimum—to make the streams come down in floods when they had come down with a steadier flow, and not in constant running streams. There seems to be ground to think that the floods are more severe than formerly. The late Trinidad flood is a marked instance. The Eden flood, which caused the wreck on the Denver and Rio Grande, was also in one of the obscure channels that one would scarcely think of. Originally the bridge was a few feet wide. These channels
2148 keep constantly increasing in size. There were floods in former times, and sometimes great floods, yet I think we have reason to notice their increasing violence as a consequence of the de-grassing of the plains.

Aside from what has been said the soil is very much more absorbent in the forest than it is outside. There you will find a covering of spongy earth or decayed needles—humus—that may be several feet deep. It is sponge-like. In some places it becomes muck and pe-te after the forest has been removed. The water which falls on such soil is not only prevented from running off in arroyos and rivulets by the physical obstacles, such as needles, but the
2149 ground is so absorbent that it sinks in. Where the forest has been burned off the fire penetrates this surface soil, which is really vegetable matter. It burns it into ashes and practically destroys it down to the solid soil beneath. This leaves it hard and non-absorbent and the water runs off. The springs dry up because their sources are cut off; and hence, as is a common experience, a common fact of observation throughout the mountains, the regions free from timber or where the timber is burned off are dry. It is a common custom in road building to cut out the timber along the

roads so as to let the air and sun have access in order that
2150 the ground will dry up and harden. I knew from my own observation that the timber in the mountains was being rapidly destroyed, but really hoped that in the portion I was
2151 not familiar with this was not true, but on investigation we found the same conditions.

Referring to Bulletin 55, plates I and II are companion plates, taken from the same point on the same day, within a few minutes of each other. Plates IV, V and VI are companion plates and overlap each other, forming one continuous picture or panorama. Plate X also goes with plates I and II. It is right in the timber, about two hundred yards from where plates I and II were taken.

(Defendant Colorado's Exhibits 9, 10, 11, 12, 13, 14, 15, 16 and 17 offered in evidence.)

2153 Two of these photographs were taken from the same place on the same day, one looking into dead timber and one into green, and a third photograph, not at the same place but four miles away, with the same exposure, practically, and the same general conditions, except it is in the timber and shows deep snow while the others are bare.

(Defendant Colorado's Exhibits 18 and 19 offered in evidence.)

These two photographs were taken in the mountains at an elevation of about 9,500 feet, on Jenny creek, which is on the Platte, one looking into green timber and one into dead timber. They
2154 were taken at the same time and place, in about the month of May.

(Defendant Colorado's Exhibit 20 offered in evidence.)

This is a photograph showing the region of the Tennessee pass at the headwaters of the Arkansas river, which shows the bare condition of the country, with the stumps of the original forest.
2155 This condition as shown in Exhibit 20 extends over quite a large area.

(Defendant Colorado's Exhibit 21 offered in evidence.)

That is nearly the same region as shown by Exhibit 20, but it takes in a larger extent so that the individual stumps do not show in this picture as they do in Exhibit 20. The condition as shown in Exhibits 20 and 21 exists upon the headwaters of many tributaries of the Arkansas river, in effect at least, not always in character. These two exhibits show a good deal of timber that has been removed by cutting. In other places a large amount has been destroyed by fire. The result, however, on the protection of
2156 the snow is largely the same. With the forests on the head waters of the Arkansas river destroyed as they are, even if the other conditions remain the same, as to precipitation, etc., the flow of the river would not be the same as it formerly was, either in

character or in time. As conditions now are, the maximum
2157 tends to increase, if anything, and the minimum to decrease; also the average flow has decreased. As to time, so far as the river is fed by melting snows, the high water tends to come earlier in the spring instead of late as it formerly did. The amount of time which the present melting comes earlier than formerly I am scarcely able to say in a period of days or weeks. We know that the snows which used to lie at low elevations are not there at all, and the tendency toward an earlier flood period is evident and marked. I think it would be several weeks earlier, taking one year with another, but the flood period which we notice is a combination of the melting snow and the rains. If we could exclude the effect of the spring rains on the melting snow the portion due to the earlier snow would be still earlier than our record seems to indicate, judging by the high water in the river. The flood that comes from the melting snows under present conditions does not last as long as formerly when the forests were in their original condition. No large part of the flow of the Arkansas river in eastern Colorado is supplied by the melting snows.

2158 Yesterday I mentioned, in speaking of these transitional streams, that a small part of their water shed was in the mountains. Thus, with the St. Charles, whose total water shed is 487 square miles, we have 72 square miles above 8,000 feet, which is practically what may be termed the mountains. With the Apishipa, out of 1,116 square miles there are 68 square miles above 8,000 feet. With the Purgatoire, out of 3,292 square miles, 287 are above 8,000 feet. With the Huerfano, out of 1,867 square miles, 541 are above 8,000 feet. The rest may be properly termed as plains area and is fed almost entirely by the rains, and of course a portion of that in the mountains is fed by rains also. On the Arkansas river proper above Salida, including all the water shed, there is 1,222 square miles. That includes some of the water shed that is but little over 7,000 feet, on which snow does not lie. Below
2159 8,000 feet in Colorado the visible snow fall at any one time is slight. The aggregate in the course of a year may be considerable, but it comes usually in relatively small quantities and melts very soon. It is not protected from the heat from the ground, and hence it does not lie upon the ground for any length of time. At Fort Collins, in northern Colorado, it runs about fifty odd inches of snow a year, but one would scarcely believe that, because it gives the impression there is scarcely any snow. There is very little run-off from this snow fall below 8,000 feet; it melts soon, sinks into the ground and is evaporated. That
2160 amount of snow fall represents about one-tenth as much precipitation in water; in fact coming in small quantities it is even less than that. A snow of two or three inches furnishes practically no run-off; it evaporates, or sinks into the immediate surface of the ground and then evaporates; and it is those small storms that form nearly all of the snow fall in this region. There

is practically no sleighing in the part of Colorado east of the Rocky mountains. I doubt if any one raised around Fort Collins would scarcely know a sleigh. We have had at an elevation of five thousand feet one or two winters in the past sixteen years in which we have had what might be termed sleighing.

2161 Again referring to the drainage area of the Arkansas river in Colorado, I would state that a considerable part of that area is drained into the river below most of the Colorado ditches. For instance, the Purgatoire enters the river below nearly all of the ditches, and it has a drainage of 3,300 square miles, more than the drainage area above Cañon City on the main river. It enters the river below Las Animas and the head of the Fort Lyon canal; and below that there is Rule creek, with a drainage of 517 square miles; Caddoa creek with 102; Limestone creek with 46; Mud creek with 64; Willow creek about the same and Clay creek with 230.

These last named streams all enter below the Purgatoire and between there and the State line, as does the Big Sandy creek, with a drainage of 2,134 square miles. There is also Wolf creek,

2162 with 132 square miles; Buffalo creek 170; Two Buttes, 817; Wild Horse creek with 309, and Cheyenne creek with 350 square miles.

In response to your question asking me to state some of my duties as State engineer, I will say that the office of State engineer was originally created in this State as an administrative office, to divide or supervise the distribution of water among different claimants in the State. That was nearly twenty-five years ago. The duties of the office have been extended and all the various duties which the legislature has found it necessary to have performed by somebody in relation to irrigation, irrigation distribution, investigation and the enforcement of various laws have been clustered about that office. We have some supervision of the construction of roads, the supervision of dams, reservoirs, etc., and the supervision of water superintendents, water commissioners and head-gates, the supervision of rating flumes and the measurement of water.

2163 So the duties of that kind are very large. The office has general control of the administrative features connected with the distribution of water among the citizens of the State, and it is executive in enforcing certain laws. It is a recording office, as being the place where the claims to water are filed. It is a construction office as far as construction of these internal improvements is concerned. It is a technical office so far as the supervision and construction of dams are concerned, and other things of that character. The construction of dams referred to relates to those constructed by individuals. It does not necessarily refer to construction by the State nor anything of that kind. We are to see that they are safe and properly built. In the State engineer's office, which is now in my charge, are to be found more records and more information concerning ditches, the use of water

and its distribution than in any other one place, perhaps, in
2164 the State. The water engineers and the irrigation division engineers are all now under the direction of the State engineer and report to him and are subject to his superior orders in case they are given.

Speaking of the progress which has been made in the reclamation by irrigation of lands lying along the Arkansas river and its tributaries, I will state that there were ditches built on the Arkan-
2165 sas river by the first settlers. That would be almost a matter of necessity where those settlers were more than trappers; and consequently there are ditches dating from some time in the '50's, in the vicinity of Trinidad, and some earlier ditches on the Arkansas river proper. Those ditches have increased in number with the demand for water for irrigation. At present there are ditches on the main Arkansas, on practically all of the mountain tributaries, whether they are perennial or not, as upon those streams that are described as transitional streams, and along the main Arkansas practically to the Kansas-Colorado line. The earlier ditches were very largely small ditches, from a double reason. It might be perhaps largely from one reason—the economic one. The earlier settlers had to put in ditches without accumulated capital. They therefore had to put in ditches of such size as was within their means, and that means meant generally their own physical powers. Consequently they were ditches such as one or a few men could combine together and build. They therefore were on portions of the river where the ditches could be short, that is, in places where the fall of the stream was rapid. They were also largely on small streams, because the head works could be simple and therefore within their power. Consequently the first stage of construction not only on the Arkansas river but also on the other streams in the State was represented by the ditches located on the small tributaries.
2166 Then came the ditches of larger size that were built later, as we had people here either themselves with more capital or who had command of more capital, and in some cases they were built by people who anticipated the needs of the country, and who built ditches in corporation form. They were, therefore, constructed on a larger scale as they developed and were built to cover larger areas of country, and as the expense to these builders was less important they could then take them from larger streams. (Objection and motion.) Hence the larger ditches on the Arkansas river were taken out subsequently to the ditches
2167 on the tributaries. This fact appears from the official records in the office, where we have the dates of the construction of ditches and their size and of the number of acres which the respective ditches irrigate, which show this division of types of ditches very distinctly. These side streams like the Purgatoire, Grape creek, the Fountain and others, show a great many of the earlier ditches, short in length, irrigating small quantities of land and with relatively few users from the individual ditch. On Grape creek my

recollection is that there are something like seven hundred ditches. There are a great many on the Purgatoire. A great many of these ditches on the smaller streams, like Grape creek, are only used by one single ranchman, A great many of these small ditches are also of the same type as the large ditches on the streams, or at least the difference is one of magnitude and not of kind. Nearly all the ditches, other than those supplying simply but one or two users, are organized in the form of a corporation. They are stock companies, but are what might be termed mutual companies. They are not organized for profit. They are organized in that form as a means of constructing the ditches and as a means of management.

2168 The people who take water from them are interested in the ditch to the extent of their stock, and their share of the water is represented by the proportion their stock bears to the whole of the stock in the ditch. There is in each ditch generally some relation fixed by custom giving the number of shares to eighty acres or to one hundred and sixty acres. (Objection.) Now, some of those ditches were built by companies and then the companies on selling or disposing of part of the water sold or transferred the stock to the water users, and in many cases those companies provided that when a certain number or portion of shares are sold the management of the ditch is transferred to the users of the ditch, so that many of the companies have passed into mutual companies. In the

2169 State laws there is a difference made between the two companies; that is, a company of this type that may be termed a mutual company, not maintained for profit, is free from taxation, as it is considered that the value of the ditch and the water rights are included in the value of the real estate or land watered by the ditch. Consequently nearly all the ditches which remain in the form of a company separate from the owners of the land have gone into the second type of ditches—mutual ditches—or are in a state of transition. There are very few left in the State that are of the primitive type.

The total area in the Arkansas valley and in the valleys of its tributaries that are under irrigation I cannot give from our records here, as those are not summed up. I mean I haven't them in this room. The Census Bureau of the United States, in 1902, made some inquiry and reported on what they found in Colorado in the Arkansas valley. I have that here. That differs in total somewhat from our own records. The methods of calculation are different, and I think their figures are under the actual quantity. They are below ours. They reported that in 1902 in the Arkansas basin in

2170 Colorado there were 300,115 acres irrigated. These were in 4,557 farms. From the main river there were 212,341 acres irrigated, in 2,917 farms. They reported 795 irrigation systems in the basin. That, I think, is below the number of decreed ditches by a good deal, and I think therefore it is below the truth. They give a total cost of nearly four million dollars for the main ditches.

Speaking of the value of these irrigated lands, they of course vary

according to the location with respect to market as well as the quantity of water available and its surety of supply. There is probably almost none of the land that can be had for less than thirty dollars an acre. Some of the more highly cultivated land, as orchards and market gardens, in the vicinity of Cañon City, run up to eight hundred and a thousand dollars an acre. Some lands near Rocky Ford under a high state of cultivation run up to the vicinity of two hundred dollars an acre; and the other lands in the valley fall largely between those extremes—say between thirty dollars
2171 and two hundred dollars an acre. To estimate an average value of this land I would have to do it with some degree of uncertainty—some latitude in the estimate—but I would say from sixty to seventy-five dollars an acre. I think there is a larger proportion of the land that would run down toward the lower limit than would run up toward the higher limit, so that an average would be less than the mean between those two extremes. These same lands would be worth practically the minimum Government price of one dollar and twenty-five cents an acre without irrigation. Sometimes there are local reasons which make a bit of dry land have an added value; but the Union Pacific railroad has been selling its land grant in eastern Colorado within the past two years,
2172 without water, at about one dollar or one dollar and twenty-five cents an acre. This land in the valley of the Arkansas river and its tributaries is not available for agricultural purposes without irrigation. It is scarcely adapted for living or supporting life without irrigation and would scarcely grow a tree or green grass without an artificial application of water, and the lawns and shade trees in the town and cities along the river are grown by irrigation, and water for irrigation is an important part of the water supply of every town and is considered usually as a part of their domestic water.

Speaking of the productiveness of these irrigated land in the Arkansas river basin, or the amount in money which said lands have produced, I have a summary of the census returns of 1899 by
2173 counties. This is the census of 1900. We know, of course, of individual instances or of individual farms, where well farmed, with intelligent irrigation, where the production will run up very large or very much per acre, as in fruits, sugar beets, cantaloupes and market gardens. There is a constant tendency to break up into smaller holdings and to go into more intensive agriculture. This census report gives the number of farms and the valuation, etc., in the various counties in the Arkansas valley. Now, if we take a county like Otero, whose productions are practically all from irrigation, although there are stock farms outside, and ranches, the number of farms given by the census, I think, includes both, and states that there were 814 farms in Otero county, with 244,594 acres improved. As I say, that includes the ranches which are unirrigated (objection), thus including a great deal of ranch lands
2174 of very small value. The valuation given for the farms is much less than that of the irrigated sections. The valuation

of the farms is given as $3,995,630; the live stock, $2,335,017; the value of farm products as $1,089,344. That is from Otero county, a typical irrigation county. Excluding live stock there could be no agricultural products of any consequence raised in that county without irrigation; and the live stock industry is more or less dependent upon the crops raised by irrigation. The stock runs on the range during the summer and is brought under fence in the winter
2175 and fed alfalfa, which is grown locally there, and corn purchased in Kansas.

Referring to Defendant Colorado's Exhibit 22, headed "Statistics the Arkansas River Water Shed in Colorado," I will state that this paper is compiled from the censuses of 1870, 1880, 1890 and 1900. The particular figures which I read were from the census of 1900, but the document as a whole contains certain figures from the counties in the Arkansas water shed in Colorado at these
2176 four censuses. It shows the counties by name which are within the Arkansas river water shed, or partly so. It gives the area of each in square miles; it gives the population of each county at each of these decades; it shows the manufactures in each county at each census, giving the number of the establishments, the amount of capital employed, and the wages paid; it also gives the agricultural statistics for each of these four censuses, giving for each county the number of farms, the area improved, the value of the farms, of implements and machinery used in operating the farms, the value of the live stock, the value of the farm products, and the total value, and then the totals of these corresponding columns are footed up, for this water shed. The area as shown here in square miles is the area of these counties, and as some of these counties extend out a little beyond the Arkansas river water shed the larger area shown is not inconsistent with the area I have previously given for the Arkansas water shed in Colorado.

2177 (Defendant Colorado's Exhibit 22 offered in evidence. Objection.)

At the bottom of the diagram is a reference to the report
2178 and the page of the census from which these figures were taken. Referring to Defendant Colorado's Exhibit 22 and that part which has to do with the population of the various counties, in the census years from 1870 to 1900 there are certain counties which show a falling off in population between 1890 and
2179 1900. These are Baca, Prowers, Kiowa and Cheyenne counties. All of these are counties in which there is practically no irrigation. There are a few flood ditches, but the total irrigated area is almost none. They are so situated as to make it practically impossible for them to irrigate there under present conditions. Take the other counties and they all practically show a gain in population between the years 1890 and 1900—all but one I think—and in most of them the gain is marked. Nearly all of the counties showing a gain in population are irrigated counties. Of

course there is an exception in El Paso county where
2180 the city of Colorado Springs is located and in the
county where Cripple Creek is located. The value of the farm products as shown by Exhibit 22 in the Arkansas valley for the year 1900, next to the last column on the sheet, is $6,442,464. On Defendant Colorado's Exhibit 22, in the column headed "Total value," the last column on the exhibit, is the sum of the previous four columns marked "Value." It includes the valuation of farms, of the implements and machinery, of the live stock and farm products, and shows a total value of $46,994,809. Within these counties which lie within the drainage basin of the Arkansas river in Colorado there are numerous towns and cities. Pueblo is the largest as well as the oldest as a point of settlement on the Arkansas river. Colorado Springs, on the Fountain, one of the
tributaries; Trinidad, located on the Purgatoire; Leadville,
2181 located at or near the head of the Arkansas river; Cripple Creek, on one of the branches, as well as other adjacent mining towns; and Cañon City, an important agricultural town just at the exit of the river from the mountains, are among some that might be named. Rocky Ford is rapidly developing as an agricultural community, also Lamar and various smaller towns of considerable size in the lower valley; Salida, on the river proper; and Sugar City in the sugar beet district. Take the towns such as Cañon City and Rocky Ford and Lamar as typical agricultural towns within the drainage basin of the Arkansas river, in Colorado, and irrigation is the absolute foundation of the prosperity of the whole community. Such towns as Leadville, Cripple Creek and Victor, typical mining towns, derive all their supplies of fruits from regions outside of their own vicinity, hence a large proportion of
their supplies comes from the irrigated region along the Ar-
2182 kansas valley. Of course some comes from other parts of the State, but practically all that they use is raised by irrigation. Excluding range stock, practically all of the agricultural resources of the State of Colorado are dependent upon irrigation. So far as the cultivation of the land and the raising of what is known as farm crops is concerned, to the State of Colorado irrigation is essential, and this applies to orchards and trees as well as to grains and grasses. There is a limited number of trees in the extreme eastern part of the State started by cultivation without irrigation, but they do not bear fruit, and there is a very limited amount of
grain raised by precarious farming without irrigation. The
2183 town of Cripple Creek is something less than forty miles from Cañon City, where agricultural products are produced; and Leadville, exclusively a mining town, is about 125 miles from Cañon City; but some agricultural products are raised near Salida and Buena Vista. On the western slope there are also irrigated lands about Grand Junction which can supply Leadville. If irrigation were not or could not be practiced in Colorado the agricult-

ural products used in the towns of the State would have to
2184 come from eastern Nebraska and Kansas, at least that would be the nearest source of supply. This would require a haul of something like five or six hundred miles.

Colorado has no important rivers within its borders which do not run out of and extend beyond the borders of the State, and there are no rivers of any particular value for irrigation purposes in Colorado which rise or originate in any other State and run into Colorado that do not again run out. If the principle were to be established that Colorado was not to be permitted to take water from streams originating within the State and running out of the
2185 State beyond its borders, the effect would be to absolutely wipe out all of the farming industry of the State, leaving stock raising as practically the only source of revenue from the lands of the State, aside from mining—I mean from the agricultural lands.

Nearly one-half of the total area of the United States lies within what may be called the arid region, a region which requires the irrigation of lands for the successful production of crops. If we take the limit of successful agriculture as twenty inches of rainfall, that would mean two-fifths, in round numbers, of the United States. Of course the term "successful agriculture" is a relative term, and with the rainfall above twenty inches—from twenty to twenty-five or even more—agriculture becomes precarious. Droughts are long continued, crops may fail for a succession of years; that is the margin of safety with the rainfall near the limit for successful agriculture is so small that it becomes very precarious and agriculture cannot be called prosperous, even if it is not an absolute failure; and so the limit below twenty inches of rainfall, which is often taken, might be taken as the limit where agriculture is possible at
2186 all by ordinary methods of cultivation; and beyond that limit for some distance it would be so exceedingly precarious that it is very risky. This estimate is practically the same as that made by Major Powell in 1878.

Where water may be had for ample irrigation, irrigated lands will support a larger population per acre than non-irrigated
2187 lands. As a matter of common observation and knowledge of the tendencies of cultivation in the irrigated lands, we see as a matter of development that the methods adopted for irrigation are intensive methods; that the tendency is constantly to give more cultivation, to break up into small tracts and to obtain immediate and great returns from fertilizers, which irrigation makes it possible to do. We see that tendency has been developed in the Salt Lake valley, it is developed in this State in the Cache La Poudre valley and in portions of the Arkansas valley. Where the unit is small the population is large, and this represents the tendency that is almost irresistible in the irrigated countries and not accidental or due to the peculiar position or location. It is also possible under such conditions to multiply the number of crops, and one reason

why the population may be greater and is greater under the successful irrigation method is that the certainty of crops becomes greater. The risk is less and consequently the population can press closer upon the immediate means of subsistence than where the element of chance enters to a great extent. The same element enters in other countries, as in Egypt, which has been known from time immemorial as one of the most populous countries, in the portion
2188 which is irrigated. The portion which is irrigated in Egypt, and which constitutes Egypt for every intent and purpose except square miles, is not twice the irrigated section of Colorado. The populous valleys of the Tigris and Euphrates have been known from time immemorial. In the valley of the Po in Italy the population runs up to something like 700 per square mile as a whole. The tendencies for the past few years in various portions of the Cache La Poudre valley in northern Colorado have been such as to break the land up into five or ten acre tracts. Near Grand Junction, Colorado, are similar illustrations. At Cañon City in the Arkansas valley people are living and thriving on tracts of but a few acres—two or three acres—putting in immense amounts of labor and terracing the hill sides. So these conditions have already been reached in some portions of this new State, and they show tendencies, I think, that are continuous, and need only the lapse of time and greater value of water and land to make them more evident
2189 all the way through. The cases given are typical. It makes, then, agriculture almost as certain as manufacture, because it reduces the element of risk to a great extent. It removes, then, partly, the element of speculation, if that may be applied in Colorado, when the water supply is assured. I can give some special instances of production from irrigated lands in Colorado. There is at least one case in the State where the crop of sugar beets has been thirty-three tons to the acre, having a market value of five dollars per ton. That was in northern Colorado, and I mention it because I know of that case. There may be others larger. I have known of large fields that averaged from twenty-two to twenty-eight tons to the acre. I have had some occasion
2190 to keep track of the sugar beet industry. Our experiment station has been making investigations along that line for fifteen years prior to the sugar industry in this State. My impression is that the average production in Nebraska was less than seven tons to the acre, and that was a good return, but I am not sure of my recollection there. The sugar beet test on Colorado beets made first, I think, by the experiment station in 1888 or 1889 when they first started, showed results obtained in the yield of sugar so large as to be taken with incredulity by our eastern friends and those interested in sugar. The first sugar beet factory was put in at
2191 Grand Junction, I think, in 1899, and at Rocky Ford in the following year. The success at Rocky Ford was marked from the beginning. The yield was large in beets, and the yield in sugar per ton of beets was large. It has generally been considered that

twelve per cent. of sugar product was a successful yield of sugar. At this factory they made a flat price for beets containing twelve to fifteen per cent. of sugar, and nearly all of their beets exceeded this fifteen per cent., so that the average was nearly seventeen per cent. Since that time there have been developed other factories in the State, so that now from one place in this State one can see the smoke from six beet sugar factories—at Loveland, at Fort Collins, at Longmont, at Windsor, at Greeley and at Eaton. Each of these factories represents the investment of a large amount of capital. They represent a large amount of labor and investment for the farmers. With few exceptions the industry has been completely successful with the farmers, and those exceptions are of that type of fail-
2192 ures which is found in any industry. There is also a factory at Sugar City in the Arkansas valley, one of the earlier factories, and it is reported that one or two others have recently been arranged for. These factories obtained beets that have exceeded fifteen per cent. in yield of sugar in all places, and in one or two years some of the factories have had an average in the neighborhood of eighteen per cent. or over. I think one factory exceeded that amount one year. In our analysis of beets at Fort Collins we have had beets that exceeded twenty-two per cent. of sugar. I have heard and have good reason to know that one of the factories paid for sugar something like twenty-six per cent. That was perhaps an exceptional case and not a normal one, as in that particular case I think the farmer also lost money; but the yield of sugar is very large. The percentage of richness is large. And that also is due to the
2193 same reason that the cantaloupes are sweet where raised under favorable conditions. I think that there is about fifty thousand acres in sugar beets in this State. In order to make beet growing successful a farmer counts that he must get twelve tons of beets per acre. The price per ton is fixed by the factories and that is given as a guaranteed rate. A number of factories give a flat rate of $5 per ton independent of the sugar content, providing that content is twelve per cent. of sugar or above. The annual prod-
2194 uct of beets is probably about 600,000 tons. The average price is close to $5 per ton. I think that sugar has brought in the neighborhood of five cents per pound or $5 per hundred. I am not so familiar with the prices. It has fluctuated be-
2195 tween $4.20 and $5.50; but at $5 per hundred that would mean a price of $100 per ton for sugar. At that rate 60,000
2196 tons would be $6,000,000. The pulp from making this sugar, which retains some of the sugar properties, is being used for feeding cattle and sheep. It has been shown by actual experience by farmers and at the experiment stations that it forms a very valuable food supply in connection with alfalfa, alfalfa being a product of our irrigated lands, grown in great abundance.

Speaking of feed for animals, if irrigation were done away with in this State, the only stock raising that could be carried on would be the range industry, that of cattle grown on the range and not fed

for market, with very rare exceptions. They would have to be fattened and put into shape for market, and as is evident in this State, in a good many places the combination of the two makes a model agricultural condition. Each renders the other more valuable, and without irrigation the cattle would not be at all in shape for market.

2197 The crops already developed by irrigation in this State are to some extent accidents. I mean by that that the conditions of irrigated agriculture, and especially such as are here in the State, are such that it is largely a question of will—a question of desire—as to what crop one will raise. You have under the best irrigated conditions the soil kept moist and the right degree for the best production; on the other hand in the arid country

2198 you have the freedom from rain, which means especially freedom from clouds. You have the presence of sunlight—the motive force of the sun acting on the plant, which is the source of the growth of the plant so far as the power there produced—heat and light—hence it makes the model condition for agriculture. The particular crop grown is limited mostly by the skill of the individual, his knowledge, his methods, and certain limitations of climate. We cannot grow oranges in this State, for instance, but within a wide range the selection is left to the discretion of the cultivator. For instance, in this State a series of specialties are growing up. Communities are known for certain things. Rocky Ford is known not only for sugar beets but for cantaloupes. The regions around Pueblo and Denver are known for their market gardens, because of the advantages of the market. They take this year one thing and another year perhaps another. Cañon City is known for its apples and small fruits; Grand Junction and Palisades for peaches; the North Fork country, over in Delta and that region, also for peaches and pears and other

2199 fruits; at Longmont are currants and peas; at Loveland raspberries; at La Porte, near Fort Collins, we have onions; at Greeley, potatoes. The special crop raised is often due to the fact that there has been some one man there who has been a man of energy and knowledge, who has given an example to the community. At Loveland a nurseryman had developed a raspberry plant that produced berries which not only had the excellent qualities of other raspberries, but also had the ability to stand up under shipment; and from that beginning they have grown to cultivate hundreds of acres in that product and they ship them out by carloads. At La Porte onions have developed and a certain region there makes a specialty of onions and has great success with them. Some of these specialties produce great crops in values, sometimes several

2200 hundred dollars an acre. At Greeley came the potato industry, which was encouraged by a combination of soil conditions, the soil being sandy and free from potato diseases that are found elsewhere. At Longmont came the development of peas from the fact that a canning factory was established there; and the

largest currant farm in the world is at Longmont. And so other instances can be given throughout the State, The fact that the raspberry industry has developed at Loveland is not peculiar to that place. It could have been developed at almost any other place in the State had it the combination of the skillful gardener and the plant developed there. And so with cantaloupes in the Arkansas valley. Those were developed there from the same plant that is grown East, but it showed under sunny conditions what many other plants do—a development of those qualities of sweetness,
just as the beet does in sunshine, a condition which the cul-
2201 tivator can very largely control. The same is true of apples.

The cantaloupe industry started at Rocky Ford but now it extends for miles up and down the river from Pueblo to Holly. The number of carloads of cantaloupes shipped out by fast freight or express last year I think was very nearly eight hundred. The cantaloupe raised in that particular vicinity has acquired a reputation which makes the product sought after all over the country and has a value of not far from $1.00 per crate at that place, and they produce many crates to the acre. I think the better yield has run in the neighborhood of a hundred crates to the acre. These cantaloupes are shipped to cities in the East. They have not, how-
2202 ever, been as widely distributed as they may. They have been shipped some seasons as far as Boston, New York, Pittsburg and Buffalo in carloads, and in fact I think the larger part marketed has been in the extreme eastern cities. Some of the orchards of Rocky Ford have had very high productions both in money and in the yield of apples. The quality is especially good, grown under the conditions of sunshine we have here, and would hardly be recognized as the apples of the same name grown in the East. The apples grown in Colorado have a much higher color, a waxy surface and firmer flesh and a better flavor. Now, these are peculiar to the conditions not particularly in Colorado but where the moist soil is combined with a sunny climate, and so far as apples
are concerned, we always have the cool nights and the rela-
2203 tively cold climate, which also goes with the best apple production. Now, in apples we have had yields at Cañon City running up to $100 an acre; and so with other products.

In speaking of the specialties that have been developed in these different places, they have been in addition to and superadded to the ordinary agriculture such as wheat and alfalfa. People come in and take small tracts and develop these specialties, and the tendency is toward dividing up the larger tracts into these specialties
all the way through, and there are many other specialties
2204 that are likely to be developed. Individual apple trees yield more and yield earlier in this country under the conditions prevailing than in the East. A tree here will produce some apples at an age that in the East you would not consider possible; but in addition to the actual number of bushels yielded there is a much larger percentage of it of marketable quality. The apples are free

from blemish. They stand exceedingly high in the market among choice appearing apples. Buyers come here from Chicago to purchase apples for the choice eastern markets.

Those are merely instances of the general character of our conditions.

Celery is also raised here in large quantities. I have known
2205 celery to be shipped in carload lots from here to Spokane, as fine in quality as could be found anywhere. And so while I have mentioned four or five special crops, the general conditions are such that a great many other crops would have correspondingly good qualities.

In regard to the number of apple trees that can be raised per acre, I know as a matter of fact that they grow apple trees here a great deal closer than is done in the eastern orchards; that is the common practice, and I have never seen any ill results from it, because the trees have been absolutely loaded down with fruit. It is necessary for them to prop up the branches. One of the largest growers in the State has invested a good many dollars, I think several hundred, just for props to hold up the limbs. The trees are generally planted from twenty to thirty feet apart.

2206 Recurring to the Arkansas river and its characteristics, on page 4 of Senate Executive Document 120, Major Powell, who prepared the answer to the Secretary of the Interior, which is transmitted by the Secretary, states as follows:

"The waters of the Arkansas that flow during the irrigating season are partly used in Kansas, but chiefly in Colorado; so that already in critical seasons the river runs dry near the Colorado-Kansas line. The future development of irrigation in the valley of the Arkansas therefore depends chiefly upon the storage of water. This storage can be accomplished with advantage, in fact with great economy, in
2207 the mountain regions of Colorado. Along the headwaters of this stream in the mountains there are many mountain meadows and morainal valleys where lakes can be created to store large bodies of water at small expense. When the waters of these mountain streams are stored in the upper regions, where they are comparatively clear, the reservoirs have a permanent value, from the fact that they will not be speedily filled with sediment; but if reservoirs be constructed below on the plains, and the rivers taken out where they are muddy and excessively muddy, as is the case with the Arkansas, the storage basins will be speedily filled with sediment and destroyed. If stored on the plains, as in the case of the South Platte, the waters must be diverted from the natural channels, where they debouch from the mountains and carried in canals to the storage basins. This adds greatly to the expense of storage.

"But there is another consideration affecting this question, of great importance. In the lowland reservoirs the evaporation from the surface would be 50 to 75 inches, and the lowland reservoirs would therefore lose a large body of water in this manner, while in the highland reservoirs the evaporation would probably be not

greater than 25 inches, and might often be less. Whenever high land reservoirs are possible the waters must be stored in the upper regions, and these conditions control the case of the Arkansas river. The waters of the Arkansas cannot be taken out within the boundaries of the State of Kansas and stored in reservoirs, from the fact that they contain so much silt that the reservoirs would be speedily obliterated. The flow of waters in the irrigating season is already provided for. All additional irrigation from these waters would be so small that all State interests may be neglected.

"The irrigating season on this river is, on an average, something more than two months, while the waters run to waste for more than nine months. It is this waste water that is to be stored in the mountains. Whatever is thus stored will decrease the volume
2208 passing the Kansas-Colorado line during the none-irrigating season, but will greatly increase the volume passing that line during the irrigating season; and, as in the case of the South Platte, the prospect for irrigation in western Kansas depends upon the storing of water in Colorado. The greater the storage the greater will be the area irrigated in Kansas.

"It must be understood that in the above statement the primary facts and principals have been set forth and general results given. Exact quantitative results can not be given at this stage of the investigation; but if the work of the irrigation survey is continued until the survey is completed, practical quantitative results will be afforded.

"When the investigation was begun under the instructions of the Secretary, I had not carefully considered the subject, and had made no collection of the available facts relating thereto; and I supposed that the waters of the South Platte and of the Arkansas falling in Colorado would be wholly or chiefly utilized in Colorado and I reasoned in this manner from the consideration that the people of Colorado are already engaged in these industries, and are more likely to speedily develop irrigation industries than are the people in Kansas and Nebraska. But there was another consideration which engrossed my attention for the time. On the arid plains no perennial streams are born. The water which falls from the heavens is in the main evaporated back to the heavens, though when great storms, fall storm-waters, collecting for a few hours or a few days at most, flow into the perennial streams that head in the mountains and cross the plains; and I suppose that like results would follow from the spread of irrigating waters on the lands. But experience in California, in Utah, in Colorado and on the Gila in Arizona abundantly exhibits the fact that the waters used in irrigation are but partially evaporated, and that a very large quantity finds its way again to the streams. It is thus that the facts of experience have modified preconceived hypotheses.

2209 "Ultimately a very large area in Kansas and Nebraska will be irrigated by impounding the local storm-waters of that region, and the typographic conditions are very favorable for

such enterprises. But besides the irrigation which it is possible to accomplish through the impounding of storm-waters, considerable areas will be irrigated through the utilization of the waters of the North Platte, the South Platte, and the Arkansas—all contingent, however, upon the condition that the waters of these streams be stored above.

"It must be remembered that the upper Arkansas, the North Platte and the South Platte are not navigable streams. They are all exceedingly broad, muddy rivers, having great declivity, and so shallow as to be practically impassable for even canoes during the greater part of the year. They are thin sheets of mud tumbling down a highly-inclined plane; so that the interests of navigation are in no way affected by the use of these streams for agriculture.

"The use of these streams for agricultural purposes will have no practical effect upon their uses as powers in Kansas and Nebraska. Because of the great amount of sediment which they carry, they have little value as powers; for if hydraulic works were constructed along their upper courses it would be at an enormous expense, on account of their great width and because they run through vast accumulations of sand; and if the streams were dammed and ponds created they would speedily be filled by the enormous inflow of sand. There is yet a further consideration. The rain which falls in Kansas and Nebraska furnishes a sufficient volume of water for the Platte and Arkansas alike for all possible prospective use as mechanical powers.

"From the above statement it will appear that the question of the use of the Platte rivers and of the Arkansas is one affecting agriculture only, and that the amount of irrigable lands redeemed in Nebraska and Kansas by the waters of the Platte and Arkansas depends upon the amount of water stored in Colorado and Wyoming.

"I am, with great respect, your obedient servant,

"J. W. POWELL, Director.

"The Secretary of the Interior,
"Washington, D. C."

2210 Also referring to pages 6 and 7 of the same record, which is the letter of the Commissioner of the General Land Office to the Secretary of the Interior, transmitted by the Secretary, in answer to a portion of the same resolution of the Senate, in answering a question as to whether the title conveyed by the Government covered the privilege of diverting water, etc., I find the following:

"DEPARTMENT OF THE INTERIOR,
"GENERAL LAND OFFICE,
"WASHINGTON, D. C., December 8th, 1888.

"SIR: I have the honor to return herewith the resolution of the Senate of the United States of August 29, 1888, which you referred to me on the 1st September, 1888, with a request for the expression

of my views 'upon the inquiry as to whether the title conveyed by the Government to land bordering on the streams specified conveys the privilege of diverting water therefrom beyond what is necessary for use thereon for irrigation and mining purposes, and what action is necessary to protect the rights of riparian owners along the waters of said streams in Kansas and Nebraska.'

2211 "This resolution refers to the diversion of the waters of the Platte and Arkansas rivers and their tributaries for irrigation and other purposes, in Colorado, and inquiries, first, to what extent such diversion affects the flow of the waters of those streams in the lower valleys, and especially during the growing season; second, whether the title conveyed by the Government to lands fronting on said streams covers the privilege of diverting water therefrom beyond that necessary for use thereon for irrigating and mining purposes; third, what action is needed to protect the rights of riparian owners along the waters of said streams in Kansas and Nebraska; and fourth, what measures can be devised to increase the flow of water in these streams during such season.

"Of these matters only those embraced under the second and third heads come within your request for an expression of my views.

"In reference to the former, I have to state that the title conveyed by the Government carries with it the right to the enjoyment of the water privileges attaching under the common and statute law to the proprietorship of the land. This right is affected by certain provisions of the acts of Congress of July 26, 1866, (14 Stat. 253), July 9, 1870, (16 Stat. 217), and May 10, 1872, (17 Stat. 91), now embodied in sections 2339 and 2340, United States Revised Statutes. These sections read as follows:

"'SEC. 2339. Whenever by priority of possession, rights to the use of water for mining, agricultural, manufacturing, or other purposes have vested and accrued, and the same are recognized and acknowledged by the local customs, laws, and the decisions of courts, and the possessors and owners of such vested rights shall be

2212 maintained and protected in the same; and the right of way for the construction of ditches and canals for the purposes herein specified is acknowledged and confirmed; but whenever any person, in the construction of any ditch or canal, injures or damages the possession of any settler on the public domain, the party committing such injury or damage shall be liable to the party injured for such injury or damage.

"'SEC. 2340. All patents granted or preemptions or homesteads allowed, shall be subject to any vested and accrued water rights, or rights to ditches and reservoirs used in connection with such water rights as may have been acquired under or recognized by the preceding section.'

"The foregoing statutes recognize the rights subsisting under the 'local customs, laws, and the decisions of courts' to the use of water for mining, agricultural, manufacturing, or other purposes, and enact that the possessors and owners thereof shall be maintained and

protected in the same, and the right of way for the construction of 'ditches and canals' for the purposes specified is acknowledged and confirmed. All patents granted or preemptions or homesteads allowed are made subject to the rights so recognized, acknowledged and confirmed.

"The statutes of Colorado, which provide elaborately for the regulation and protection of such water rights, may be found in the General Statutes, State of Colorado, of 1883, page 560 *et seq.*, and for information on the general subject, Gould on Waters, sections 226 to 240, inclusive, may be consulted.

2213 "'The' local customs, laws, and decisions of courts,' so far as I am able to ascertain, appear to admit of the diversion of water from streams to an extent beyond what is implied in the expression, 'necessary for use on the lands fronting on the streams for irrigation and mining purposes.' They seem to contemplate the conveying of the water for use beyond the land fronting immediately on the streams, and even for use in reservoirs, for mining, agricultural, manufacturing and other purposes.

"In reference to the inquiry touching the rights of the riparian owners, I can only suggest, with the limited data in my possession, that the question, having reference to the vested rights of owners under existing laws, does not appear to be one for legislative or departmental action, and that in case of controversy the courts are open for the adjudic-tion of the rights of such parties, whatever they may be, under the law and the facts of the particular case.

"Very respectfully, S. M. STOCKSLAGER,
"Commissioner.

"Hon. William F. Vilas, Secretary of the Interior."

2214 I now have before me the 21st Annual Report of the United States Geological Survey, 1899–1900; part IV; hydrography; and opposite page 609 there is a map marked "Plate No. 113," which shows the high plains and accompanies a monograph by Willard D. Johnson on the subject of "The high plains and their utilization." The map shows the Great Plains in Texas, Kansas, Colorado and adjacent States, and the streams, including the Arkansas river. The Arkansas river is shown on this map from its source down to near the State line of Colorado as a full line, but between a point near where Lamar, Colorado, is located and a point a little above Dodge City in Kansas it is shown by a dotted line in the same manner as other intermittent streams that are dry at portions of the year. This dottted line on the map would indicate that the maker considered the stream one which was dry for portions of the year.

2215 (Defendant Colorado's Exhibit 23 offered in evidence.)

Referring to the value of the potato crop of Weld county, Colorado, which is known as the Greeley country, I will state that it ranges in the vicinity of $3,000,000 per annum.

In reading historical references bearing upon the Arkansas river in western Kansas, I referred more particularly to those showing the river in that locality was often found dry or with but little water running in it. There have been some instances, but not so many as might be expected, when the waters have been found high by
2216 the writers, and times when it would be difficult to ford. Pike mentions the fact that the river rose within a day or two after he reached it in October, 1806, and that this rise was immediately following a heavy rain, and that they tried to send Lieutenant Wilkinson down the river, but he stranded, I think, the next day. The river sank. And there are various cases, like that at Dodge City, which was quoted, where they speak of the river at times having considerable water in it. It is still true of the river in that locality that there are times when there is considerable water in it, like the flood of July, 1904, when it washed out the country near Wichita and in that vicinity, where rains in the vicinity have an immediate effect upon the adjacent river.

I spoke of the precipitation in Colorado amounting to
2217 about 14 inches a year. This is unequally distributed throughout the year, first in months. The months of April and May as a rule have the largest precipitation in inches. The summer months, July and August, are months of showers. These showers may be small or large, that is, they are thunder showers, and frequently come with very great violence. They approach the character of what we speak of here as cloudbursts, which means a very heavy precipitation in a very short time. Occasionally there may be a continued rain lasting for one or two or three days, but that is rare. This same condition of extreme, violent precipitation is characteristic of the plains and extends all through the arid country. There are very violent thunder storms with heavy hail very frequently, and a very great rapidity of fall, much faster than the ground can absorb. There was such a heavy storm as that in August, 1904, at Dodge City, Kansas. Nearly two inches of
2218 water fell there within a very short time.

All of the lands irrigated from the Arkansas river and its tributaries are situated within the drainage area of the river and its tributaries, so that the seepage or return waters from irrigated lands go back to the tributaries or the main stream. Where lands are irrigated on the tributaries they are most always close to the stream, near its banks. When you reach the main stream the larger ditches are extended farther back from the stream and cover a wider area of territory, but still within the drainage of the river.

2219 Referring to the subject of seepage and return waters, I will state that I have investigated this subject. I made the first series of seepage measurements in 1889 or 1890 on the Poudre river in northern Colorado, making the measurements from the foot hills to its mouth at the Platte, a distance of perhaps 60 miles. Those measurements have been continued every year since that

line. They have been extended in a similar way over adjacent streams until we have taken in all of the Platte and its tributaries—the South Platte, including the Big and Little Thompson, the St. Vrain, the Boulder and South Boulder creeks, the Left Hand creek,
Clear creek, Bear creek, and the main South Platte, from the
2220 mountains to the State line. These investigations have also extended to the Arkansas, the Rio Grande, and other streams, and they have shown that the stream increases; that throughout an irrigated region a stream may be drained dry and within a short distance it will again be a flowing stream of perhaps considerable magnitude. That is most noticeable through the irrigation districts and under the irrigation ditches. As a consequence, that water may be drawn from what has been a dry stream; that this amount is considerable, both in itself and as a means of increasing the agricultural production of the State; that this water often shows in the form of swamp or seeped lands, and that it gradually reaches the river either through the extension of the seeped lands or through lateral drainage channels. Now, upon the Poudre the amount has increased during the time of these measurements from about 100 cubic feet per second of time until now it is something like 150 cubic feet per second. This increase has taken place within the last fourteen years. On the South Platte the amount of return waters is now approximately 1000 cubic feet per second. That is on the Platte and not on the tributaries. In determining the seepage or return waters, other tributaries were excluded; but this includes the increase in the water in the stream from these practically invisible sources or sources which we have reason to
know are seepage waters—drainage waters. Prior to irriga-
2221 tion there were practically none. There were a few cases of oozing springs, but not many. On the Arkansas river the return waters amount to in the neighborhood of two hundred to three hundred cubic feet per second of time from Cañon City to the State line. We have also made some measurements in the lands above, the hay lands about Buena Vista, and there the percentage of return water is much greater. The water is applied on hay land, which is a very porous soil, and not far from the stream, so that the whole country is something of a marshy country. All this water which returns to the stream forms, then, an additional supply in the stream, and is again taken out in canals which may be situated lower down, and thus it makes an appreciable and
important addition to the supply of water in the stream.
2222 Of course it does not add actually to the original amount of water which would be in the stream if none were taken out, for there is a certain amount of loss by evaporation and in plant life, when applied to the land; but it does increase the aggregate—the sum—of the amounts taken at the several places, but does not increase the amount at any one place more than it had been before. Between Cañon City and the Colorado-Kansas State line, there was practically no natural seepage into the stream; that

is, the adjacent country did not furnish much of any water. Nearly all of such seepage as now shows can be traced to conditions
2223 since the irrigation ditches were established. Since irrigation has been practiced between Cañon City and the Kansas-Colorado State line we find that the aggregate or sum total taken out by the various ditches along the river will be greater than the amount found in the river at any given place. They use in the aggregate, therefore, more than appears to be in the stream or than passes Cañon City, and that is true because a great deal of the same water is used over and over again. So the amount of the water appropriated, decreed and used between Cañon City and the State line on the Arkansas river is greater than the ordinary flow of the river at any given point in the State. It is also true that the amount of water appropriated, decreed and used is often misleading to one not familiar with conditions, because of the fact that all of the ditches are not always using water at the same time. In the first place it may be said that the decree of a ditch stating the amount
2224 of its appropriation is practically a statement of the maximum amount which it can have under that decree or appropriation; therefore, it may be that the stream is over appropriated for any ordinary time. The ditches which have the first right and the first appropriations and prior decrees would be entitled to the water first if they needed it, so long as the stream would supply it. In case there was an excess of water—a flood or increase over the natural supply—then the next ditches may take water, and so it continues. Sometimes, then, the ditches may not call for the water—may not need it. While these decrees or appropriations recognize the right of the ditch to a certain amount of water if it is in the stream, they do not force the ditches to take water if they do not want or need it. On the contrary, under the provisions of law and custom, if a ditch does not need the water it has no right to it, and it is the duty of the water commissioners not to turn it in unless it is needed. The amount of a decree, then, represents the rate of flow which the ditches may be entitled to; and hence if they can dispense with the water for a greater or less time it may go into another ditch and might be said to be used by different ditches at different
2225 times. A given amount in a stream may be much more effective than the number of cubic feet in the stream itself. The term "decree" which I have mentioned here has not been referred to before and it may be defined as the finding of the court and represents the conclusion at which the court has arrived after hearing the evidence as to the amount of water to which a ditch is entitled, and the date. It may be considered as a formal finding of the court as to the vested rights of a ditch. It gives the quantity, and as the date is of importance it also gives the date to which that right attaches. In most cases it is practically true that the decree states the maximum quantity to which the ditch is entitled. Under our constitution, which represented a condition existing before that

time, the right to water was obtained by usage, and hence the amount of their appropriation depends upon the amount of which they had made use; and of course as the same water could
2226 not be used by two different parties, the date then becomes of considerable importance. It is also an essential element in the findings. The legislature has provided means and methods for action by the courts so that a formal investigation is made and it is formally found how much water a ditch is entitled to and the date. It therefore really represents, as I said before, an investigation and declaration of the amount of their vested rights. The State is divided by legislative enactment into water districts, which are numbered from 1 to 67, I believe. The Arkansas River water division includes water districts numbers 11, 12, 14, 17 and 67, on the Arkansas proper, and number 10 on Fountain creek, 13 on Grape creek, 15 on the St. Charles, 16 on the Huerfano, 18 on the Apishipa, 19 on the Purgatoire, and 66 is also in the Arkansas water shed but the stream draining it does not flow into the Arkansas until in the Indian Territory. That is on a branch
2227 of the Cimarron. All together there are twelve water districts in the Arkansas water shed, excluding a portion of district number 23 which runs over a little onto the Arkansas water shed in South park. The decrees establishing the rights of water users in a given district are entered by the district court of that district or some county within that district and settle the rights as between all water users within that water district. Prior to the entering of a decree statements of claims for water rights are filed in the district court and the proceeding to adjudicate the rights is initiated by a petition filed by some water user. This is all a matter fixed by statute. After these preliminaries have taken place, then either the court directly or a referee appointed by the court hears evidence
2228 upon the rights of the various users in the district, and based upon that evidence the decree is entered. In all, I think, of the districts in the Arkansas water shed such proceedings have been had and such decrees entered, unless it may be in numbers 11 and 66 and possibly one other. The proving of these rights necessitates the expenditure of considerable time and money by the various owners of water rights within the district, at times a great deal. There is a statute which requires that appeals must be taken within a given time after the entering of a decree, and it is also provided that the decree cannot be opened up after a certain time, and after that time it becomes final in the fullest sense and cannot be interfered with by those who were parties to the original proceeding.

The rights secured by these decrees are conveyed by the owners as their lands are sold, and also separate from the lands, sometimes by direct conveyance and sometimes by transfer of stock in the
2229 ditch companies. The relative rights of the users of water in any given stream, that is, as to which shall have the first or better right, depends upon the priority of appropriation and use.

That is declared in the constitution and was in vogue long before that.

As land is irrigated from year to year it requires less water; that is, land usually requires more water when first brought under irrigation than after it has been irrigated for a series of years.

2230 My observation and experience have shown that where large tracts of land bordering on a stream have been brought under irrigation the seepage or return waters from such irrigated lands tends to increase as the years of irrigation increase. During the first few years there is very little seepage. It takes some time for water to get to the stream from a ditch that lies at some distance from the stream, by seepage. The methods adopted to determine the amount of return waters to a stream, the Arkansas river, for instance, are as follows: It consists in dividing a stream into series or sections, measuring the water that enters each section from all visible sources and the water that goes out from that section. The measurements are made by parties supplied with instruments for the measurement of water and they pass along the whole length of the river, practically over every foot of it. A measurement is made, we will say, at Cañon City; then the inflow tributaries, like the Four-mile and other creeks that may come in in the intermediate distance, are measured. All of the water that is taken out in the canals is measured also. Then if there be neither gain nor loss the amount left in the stream would be represented by adding the inflow to the original amount and subtracting the outgo. That would show what remains, provided there is neither increase nor decrease from other sources. Then a measurement of the river is made and that is compared with the balance

2231 which we should expect by adding the inflow and subtracting the outgo. We very rarely find them the same. There is either more water than would be shown by that balance or less. Generally in the irrigated sections there is more, and this is the seepage or return water. We have found that the irrigation of large tracts of land has produced running streams in what had formerly been dry gulches or arroyos, and they are in fact sometimes used as the sources of ditches and filed upon for water rights. These dry gulches or arroyos do not run water simply for the time the land is being irrigated but they form nearly constant streams. This is analogous to the springs of a more humid climate. The lower ground is saturated and this water percolates out very slowly so that it forms a constant supply, and except for the difference due to temperature, which affects it, the streams which are sup-

2232 plied from that source are practically constant the year round.

Of the irrigation months there is probably a more permanent flow of water found in the Arkansas river in Colorado in May and June than in any other months. The largest flows are found more commonly in July and August, but those flows last for shorter times, being due to storms, and we are not so apt to think of that as the prevailing condition of the river. The largest

amount of water is taken out when the needs are greatest and when the supply is greatest. The needs in the Arkansas valley run
2233 from early in the spring until rather late in the fall, for fruit trees especially, and they can begin to irrigate as soon as the spring opens, which in places in that valley is very early, so that they irrigate a great deal of the year, nearly every month of the year, more or less. Of course if the supply of water is scanty the extent of the supply is the limit to the amount they can take. The amount of water needed during May and June is more than during almost any other month. At that time nearly all of the crops need irrigation, except for rains. There is all of the alfalfa acreage, wheat acreage, and other cereals, and those crops form the bulk of the acreage, so that the demands for water in quantity are greater during those months than any others. Now, the demands are greater there partly as a reflex action of the conditions mentioned. Crops which require water only late in the season will be planted only so far as they are reasonably sure they may have water. Those crops are largely money making crops, so that if they were sure of more water in the later seasons they would plant more acreage
2234 there and less crops requiring water early in the season. During the spring and summer months when there are flood flows or when there is a large normal flow in the river a great part of this water is withdrawn from the river and applied to irrigated lands along its course in the State, and these irrigated lands to which water is applied may be considered as acting as reservoirs. They store up the excess water when so applied; and that which comes back to the river comes back more gently and scattered over a greater period of time, or at least quite a large portion of it does. It then is supplying constantly more water to the river. The water that has been applied during the flood periods in the summer comes back somewhat later, the length of time depending upon the distance of the land from the river, and thus the tendency is to produce greater uniformity in the flow of the stream, and by
2235 producing greater uniformity it produces a more constant supply in the stream. The amount of return waters on the Arkansas river from Cañon City to the State line, as I have said, is about two hundred cubic feet or a little over per second of time. There is a fluctuation from year to year, and some fluctuation is to be expected. This amount of return water is not likely to diminish as time goes on. An examination of the conditions and a comparison with other conditions on the Platte and the Poudre would indicate that it might be expected to increase. On the Poudre it has increased nearly 50 per cent. within the past fifteen years, and on the Platte more, I think. Thus, to be specific, on the South Platte in 1889 the total gain to Crook was 564 feet. Crook was then practically the end of irrigation. Measurements were afterwards taken to the State line and usually, or at least very frequently, the river was found to lose between Crook and the State line. As I said,

there was no irrigation between Crook and the State line.
2236 So the amount of 464 cubic feet could be taken as the extreme amount of return water at that time. In 1902 the gain down to that point—to Julesburg—was 803 feet, not quite doubling, but considerably more than fifty per cent., and while there has been some fluctuation in the immediate year, yet as a whole there is the evident tendency to increase.

There is no ditch or canal in the State of Colorado taking water from the Arkansas river or any tributary of that stream which belongs to or is operated by the State of Colorado. I know of one ditch within the Arkansas River drainage which was partly constructed by the State. There have been bills passed for two ditches on the western slope, outside of the Arkansas drainage, neither of which ditches has been constructed. One has been turned over to
2237 the United States, and as to the other, I think nothing was ever done concerning it. The ditch spoken of in the Arkansas basin was never built, that is, never completed. It is at least in a State of suspension. There was a projected ditch, the purpose of which was apparently as much to give labor to convicts as it was to give water to the lands below, and possibly more, and that ditch has never been put in a way for carrying water, nor anywhere near, and so far as I know it has been abandoned. Sometimes people discuss it, but I have never heard much serious discussion of it. I know of an effort having been made in the last legislature, in 1903, to secure an appropriation to continue work on this ditch, which was defeated. The ditch was projected to take water from the Arkansas river in the Royal gorge or Grand cañon a few miles above Cañon City. The first few miles of the line is an exceedingly precipitous, broken up country, all rock, and one in which it is exceedingly diffi-
2238 cult to construct, and exceedingly expensive. Then for a number of miles it crosses the "hog-backs," a series of inclined ridges with deep gulches or grades, and that is a very difficult and expensive country through which to construct a ditch. I think this ditch was something like 70 miles in length. I have never been over the line, but I think not more than two or three miles of this ditch was constructed. I have seen where the convicts worked on it adjacent to the penitentiary—some excavations and one tunnel. I have crossed the line of the ditch below and have never seen any indications of it in that vicinity. So that as far as I know the work was confined to a very short distance. It was never completed for any distance so that water could be gotten into it from the river. It would necessitate the expenditure of a large sum of money to put the ditch in shape to get water in it from the river. The work done on this ditch was done several years ago, I think about 1890,
2239 and there has really been nothing done on this canal since the early '90's. The demands on the river in the locality where this ditch was projected, from existing ditches, are such that I have never seen where such a ditch as that proposed would get any water except possibly from floods.

As to reservoirs, the State has appropriated at different times some moneys from the internal improvement fund to construct reservoirs. The State appropriates from the same fund money to construct wagon roads, artesian wells and things of that kind, as a means of aiding the communities and supplying local needs. There was one reservoir built at Monument, one at what is known as Boss
2240 Lake, in Chaffee county, and one in Las Animas county. Those are all that I think of in the Arkansas water shed. None of these are large reservoirs. We have the exact area of the Monument, but at present I would have to give it by estimation. I would suppose it might cover 60 to 80 acres. The Boss Lake reservoir is also small. The other one, in Las Animas county, near Trinidad, I have been told has never had any water in it, though I do not know that of my own personal knowledge. While these reservoirs were built under the supervision of the State engineer, yet as soon as they were constructed the management and responsibility for them, except the police responsibility, were out of the hands of the State, and therefore I have no further knowledge of their conditions. They have gone into the hands of the county commissioners of the counties in which they are situated, just as they
2241 have the charge of the maintenance and expense of roads which may be built by the State through those counties. The water for these reservoirs is obtained from the tributaries on which they lie, from the flood waters principally. They are allowed to store water in just the same way as any other reservoir in the State is. They take their turn in just the same way. After the water is stored the reservoir is under the charge of the water commissioner so far as turning out the water is concerned, and he can turn the water out to supplement the supply of water in the stream. In the case of the Monument lake, near Monument, a little above Colorado Springs, that supplies the Fountain. When the water is low in the stream the water in the reservoir is turned out and helps to increase the supply and makes it available for irrigation or any other purpose. The water is generally stored when there is an abundance in the stream and turned loose when the stream is low. This serves to equalize the flow of the stream.
2242 There are no private irrigation rights in these reservoirs. They are simply reservoirs which store the water in flood times and turn it out in times of scarcity.

Speaking now of ground water, or what is commonly called by the citizens of Kansas "underflow," I will state that I have made investigations of this ground water or the water which is found underneath the surface of the soil lying along the sides on the north and south of the Arkansas river in its course through Colorado and Kansas, and I know of other investigations of the same subject having been carried on. There was a special investigation by Congress some thirteen or fourteen years ago that was entitled "The Artesian and Underflow Investigation." The artesian investigation, which

was the beginning of that, was due to the bill in Congress
2243 passed in 1890, and I was a member of that investigating committee. At the next session of Congress it developed into the artesian and underflow investigation, there having been subsequent investigations of certain phases of the matter, as by the Geological Survey, through which Mr. Schlichter has made certain investigations. I attended the hearings in this case in Kansas during the past summer, 1904, and there heard references made by the witnesses to what was called the underflow and noticed that many of these witnesses said the source or supply of the underflow, which was claimed to be many miles in width and to extend across
2244 the State of Kansas, came from the Arkansas river. Speaking of my own investigations and those made by others, with which I am familiar, I will say that during the underflow investigations of 1891 and 1892 there were lines of levels run transversely to the Arkansas river in Kansas. There were also others run across the Platte river in Nebraska where similar suppositions had been held as to the ground water or what was termed sometimes "sheet water" and sometimes "underflow." These lines of levels showed the surface of the soil, and at different places where wells were dug the distance down to water was measured, and then this was platted in the form of a map or diagram, copies of which I have here. Now, in almost all of those cases it was shown very distinctly that the water rose as you passed away from the river—that the water had some relation, it might be said, to the surface of the soil. It approximately followed the contour of the surface. As you get out on high lands it is deeper to water, and as you get in the low land it is not so far to water. So it led, perhaps naturally, to a common belief through that country that the water was at a level with the river. That idea gave, roughly speaking, some indication as to how deep they would strike water, but actually the levels were higher than the river in almost all cases. I myself had some lines of levels of a corresponding character run, and there are
2245 others that are now in progress which we are making, but the indications so far are entirely, as would have been anticipated from a careful comparison of the conditions, so as to indicate that the water rises as you run away from the river, or at least as you run away from the immediate bottoms and it becoms higher. Now, the water runs down hill and follows the slope underground as it does above ground. I mean it follows the surface of the water; that is the water runs down hill and down hill would be measured by the slope of the water surface and not the slope of the top of the ground. So that if the inclination of the water is in any particular direction it would indicate there is a tendency for the water to flow that way. Hence if the water rises in a given direction it does not flow in that way, and this particular instance would show that the water was not running away from the river. The notion has been a very prevalent one, and there are some conditions there that have
2246 made it perhaps not an unnatural supposition. My attention was directed to it in this artesian investigation of 1890 because

Mr. J. W. Gregory of Garden City, Kansas, was in that investigation and I made his acquaintance at that time and knew his ideas. He has generally been thought to be the originator of the notion, and until hearing the testimony of Colonel Murdock at Wichita I supposed he was. At any rate he attracted my attention; and I knew the views of others connected with the investigation—Mr. Nettleton, Prof. Hay of Kansas and others—and knew the data as it was obtained, and its trend, and their conclusions, so that my attention has been somewhat attracted to that notion from that date. I have given some attention to the facts as I have found them, and it was in connection with that idea that the cross-section levels were taken under the direction of Mr. Nettleton of the underflow investigation.

Most of them were made by Mr. Follett. I have a blue-print
2247 marked Defendant Colorado's Exhibit 24, which is a tracing of the diagram in the United States report of the underflow investigation of the United States Department of Agriculture, 1892. It is Senate Executive Document 41, 52d Congress, first session, and the diagram is from part II of that report, appendix Nos. 10, 11 and 12 of the report. There are three sets of diagrams on this map, two figures or diagrams constituting a set. The first two relate to Great Bend, reading from the top; the second two relate to the Garden City line, and the bottom two to the Dodge City line. Each set,
2248 then, consists of a map of the country traversed by the survey, showing the section lines and locations of wells, railroads, rivers and streams. The principal line in each case shows the profile of the country drawn to scale, showing its ups and downs, and therefore the irregularity of the upper line shows variations of the surface, and the scale attached shows the amount of those variations. At different intervals on that line are small lines running down from the surface, with cross hatchings. Those show the locations of wells found in that survey, and the cross hatchings show the level at which water is found; hence the height of that horizontal line below the surface shows the level of the water as found at that time. At the middle or practically so the Arkansas river is shown. On the first line at Great Bend it will be noticed that the water level rises materially and prominently as you pass to the south. On the north the amount of rise is less evident, although there is a rise of a few feet as you go to the north, and at that place a hill is passed and you get into the valley on the other side. As the ground rises the water rises. That is the Great Bend line. The plat just below the surface of the Great Bend section is the map of the country indicated by the profile above. Little dots show the line of the survey, so that the survey comes through the center line of this diagram and interprets, then, the points shown above, showing their rela-
2249 tive locations. Now, with the Garden City line the same facts are shown. The Arkansas river in that case is a little to the right of the center and the water is shown by cross hatchings. As we pass to the north there is a rise of water over that in the river. In passing a number of miles to the north the increased elevation

is quite apparent. To the south it is not so apparent on this diagram.

Now, on the Dodge City line we have a corresponding diagram shown here, the rise to the south being evident while that to the north is not so much, but in the depression a few miles to the north it is not so apparent. Those were taken from the Government reports and from those by Mr. Follett. On this diagram north is to the left of the map and south is to the right.

(Defendant Colorado's Exhibit 24 offered in evidence. Objection.)

2250 This Exhibit 24 is a true and correct reproduction of the diagram shown in the Government report from which it was taken. I myself have been out a number of miles from Garden City and Dodge City, to the north in both cases, and the country as I know it agrees with this profile. I have had occasion to compare geological and topographical maps and these are substantially the same so far as the surface is concerned. Of course the distance to the water would not be obtained from the topographical maps.

I also had lines of levels run and am having others run at the present time. I have here a cross-section of the valley at Rocky Ford, Holly, Las Animas and Lamar. These are on two sheets. One sheet has the Rocky Ford cross-section, and this sheet is Defendant Colorado's Exhibit 25. It shows the corresponding data that was shown in the previous exhibit, 24, for a line across the Arkansas valley at Rocky Ford in the State of Colorado.

2251 This map was prepared from actual surveys made under my own direction this fall. The upper line shows the contour of the country; the lower diagram is a map of the region through which the line was run and indicates its location. The distance to water is shown in the same manner as prevails in the previous exhibit. The river is near the middle of the diagram. To the left the water is near the surface at the points marked wells 10 and 9, and also near the edge of the diagram at well 11, which is a considerable distance above the river. The squares shown on the diagram represent differences in level of one hundred feet. In Exhibit 24 the vertical scale there is such that two horizontal lines represent one hundred feet.

Recurring to Exhibit 25, as we go to the south from the Arkansas river the water likewise rises, showing the same general feature that I have mentioned as characteristic of this country and in fact

2252 of all countries. There are at isolated points wells that were in existence, and the height of the water level was determined by measuring down to the water in those wells already there. On both sides of the river on this line shown on Exhibit 25, as we proceed away from the river, the level of the water rises.

(Defendant Colorado's Exhibit 25 offered in evidence. Objection.)

The next map is one of similar character and shows similar pro-

files of a line run across the Arkansas river at Holly and one
2253 at Lamar, and also at Las Animas, in Colorado, all three on the same sheet. This map is marked Exhibit 26. This map was prepared from information secured by parties sent out by me this fall with instructions to run the lines at the places that are indicated on the map and to determine the surface of the ground and its elevation at various places along the line so as to make the contour, and wherever a well was found, to measure from the surface of the ground down to the surface of the water, so that it could be platted in this form. The map is the representation of those surveys. It shows the surface of the water and the surface of the ground as so determined. The lower diagram of each pair shows in Exhibit 25 a map of the country so as to identify the location
2254 of the line and of the various wells referred to. In each case the river is shown, and the surface of the water in the river, and the surface of the water in the wells, both north and south, so far as the lines went. In the Las Animas profile the water is shown to rise both north and south of the river. On this exhibit, 26, the squares show one hundred feet vertically and half a mile horizontally. The cross-section at Lamar was run north of the river and not south of the river at that place and shows a very decided rise of water there. We did not run the line south at that point because we learned of no available wells. The same was true at Holly; the line was run to the north and not to the south.

2255 Speaking of the valley comparatively, in Colorado and Kansas, as to the particular matter now under consideration I will say that the valley flattens out somewhat at places in Kansas. It is a marked trough in the western part of Kansas, as at Dodge City, which is shown on one of these profiles. In some other places the valley as a whole is flatter. Aside from a difference in degree I would expect to find the same general conditions as to the water level in eastern Colorado and in Kansas, except that this difference in elevation, indicating a rise as you pass away from the river, I should expect to be rather more marked as a rule in Kansas than in Colorado, because the rainfall is greater in Kansas than it is in Colorado, and in those regions where not affected by irrigation at least the amount of water available to soak into the sub-soil is greater and consequently the change in the level of the ground water would be more evident in Kansas or wherever the rainfall is greater than
2256 it would be in eastern Colorado where the rainfall is scanty.

We are making other surveys of the character of these in Kansas which are not yet ready to present in the form of maps. We are still carrying on the investigations as to this question of ground water in Kansas. We have not had sufficient time since being advised of the position of the Kansas witnesses in reference to this matter, and since having funds made available for the work, to complete it throughout Kansas. The subject of the ground water along the Arkansas valley has been the subject of some investigation by measurements, and consequently has been mentioned in

various reports at different times. Since the idea struck the western part of Kansas that there was such a thing as an underflow, or sheet water as it was called frequently and indifferently, the conditions there were such as to keep that notion somewhat persistently
2257 in mind, and it has been mentioned in various Government reports. It is a subject that has been sometimes spoken of in Kansas reports and also by other people who were interested in the action of water beneath the surface. Generally, similar conditions were found on the Platte. I have already mentioned the underflow investigations of the United States. The first congressional report was issued in 1891 and was Senate Executive Document No. 53, 2nd session, 51st Congress. It might be well to add to what has been stated as to the general action of water on these uplands that where the rain falls upon the surface of ground that is fairly absorbent a certain amount of it will pass into the ground, but how much may be a matter of uncertainty. As it falls in light rains a great
2258 deal of it evaporates, but some of it does sink down into the lower ground. That forms, in a humid country, and in a country of little rainfall to a less extent, a mass of standing water; but in a country like the plains, underlaid with gravel, the water is generally found in the gravel, so that it has given the impression of sheet water as it actually rises and falls very much as the surface of the ground does. The only outlet for that water is its slow passage down hill, and its passage is exceedingly slow. The rate of movement of this ground water depends upon the size of the gravel or particles and upon the slope, but it is exceedingly slow. It may be perhaps put in round numbers at a mile per year. That is far above the average, but is a convenient number to remember. Now, its passage is very slow, but it covers quite a large area of movement. That is, the cross-section area in which the water is moving may be quite large. When a well is sunk into that gravel the water runs in from the sides. It may run in quite freely. People very frequently think that a well is inexhaustible. I have heard them say that a well was inexhaustible, that it would water fifty head of cattle. Their power of exhaustibility is rather limited. But it is a very common expression. The water would flow faster as the slope of the water surface became greater, and so as water is pumped
2259 out the surface of the water in the well is depressed. The slope is increased, and it may run in quite fast. That is, the surface of the water in the well may not be depressed a large amount, yet notably increase the slope, and therefore a rapid inflow would not be any indication of the slow movement of the water at a moderate normal slope. If you double the slope of the water in the soil its speed is twice as fast. That water would then be moving down hill, whichever way that was. As its movement is exceedingly slow, the quantity of water in cubic feet per second actually moving would not be very large, or at least not nearly so large as the popular notion has made it seem, and the supply of this water would come from the rainfall so far as the rainfall is absorbed in

the ground. How much that is is a matter partly of conjecture. We know there is some. The more absorbent the ground the larger percentage of rainfall will go in. Thus, with a sandy surface, sand hills and otherwise, a very large percentage of the water will be absorbed. This is shown by the fact that there are practically no
streams or run-offs from sand hills, and water is very fre-
2260 quently found in sand hills close to the surface. Professor
Hayworth, the State geologist of Kansas, who was also a member of the irrigation commission of Kansas and has prepared the reports on the State geology of Kansas, estimates that four or five inches—(objection). But these conclusions of Professor Hayworth's have been embodied in an official report, the title of the book being "Report of the board of irrigation survey and experiment for
1895–6 to the legislature of Kansas." The statement of the
2261 four inches which he makes at one place I do not find just at
this moment, but I find this related statement on page 93 under the head of "Geology of underground water:"

"It may be stated at the beginning that it is believed a large proportion of the water comes directly from the precipitation on the plains, a proportion which perhaps can never be accurately estimated."

At the bottom of page 94 is this statement:

"To sum the whole matter up, it may be stated as an approximation that upon the average, year after year, from four to five inches of water penetrates the ground and joins the ground water. This is not uniform, for the rains are not uniform, and the absorbent powers of the surface vary greatly so that it is possible for some areas to absorb but little while others absorb large quantities."

Now, Mr. W. W. Follett, who was connected with this underflow investigation, and who made the actual surveys under the direction of Mr. Nettleton for the underflow investigation, prepared a paper for the irrigation congress at its meeting in Denver in 1894. This
paper was upon "The underflow of the Great Plains," sum-
2262 ming up his conclusions at that time. This is published in
the official proceedings of the third national irrigation congress held at Denver, Colorado, September 3–8, 1894. His paper begins on page 34. (Objection.) The quotation I will make is from page 36, at the middle of the second column. He is speaking of the amount of the underflow and of its connection with the rainfall, and its source of supply. He states:

"When you recollect that the mean annual rain-fall of this region is about 16 to 18 inches and that at least one-third and probably one-half of it comes in very sudden showers when a large percentage of the fall quickly runs off, you will see at once that the assumption that 20 per cent. to 25 per cent. of the annual precipitation goes to the subterranean water supply, is likely to be a near approximation to the truth."

Twenty to twenty-five per cent. would mean from three to four inches on a 16-inch rainfall.

In the same volume or journal there is also a paper by
2263 Professor Robert Hay of Kansas, who was connected with the same underflow investigation. He was the geologist of that investigation, and prepared papers at different times for the United States Geological Survey. (Objection.) On page 39 he says:

"Beneath it (that is, the fertile soil of the plains) nearly as extensive a deposit is found of gritty mortar beds, and elsewhere a conglomerate but everywhere porous soil, holding the water that reaches it from the surface till it is given up as springs in the highest ravines and draws of the river valleys or is invaded by the drill of the well sinker. The water it contains is very abundant. This is the sheet water of the mid-plains uplands."

Mr. W. W. Follett is now consulting engineer of the International Boundary Commission of the United States and Mexico, appointed by President Cleveland first, I think, and reappointed, and
2264 has been connected with the international water boundary for a number of years between the United States and Mexico. He was present at the time of the Elephant Butte case. He was an engineer and practiced in the West for a good many years and was then engineer on this artesian and underflow investigation and did a great deal of field work at that time. He now lives in El Paso, Texas.

Professor Hayworth has discussed this subject as geologist of the irrigation board of Kansas, and has a number of things that apply to it. In speaking of the source of the water and its relation to the rainfall he speaks especially of the heavy rainfall on the upper Arkansas at Syracuse, Kansas. This is on page 93 of the same report of the irrigation board of Kansas, and describes extensive storms that took place there and flooded the region. At the bottom of the page he speaks of Bear creek, and that portion I might read, or a
2265 part of it. (Objection.) Here is almost the same thing from the official report of the University Geological Survey of Kansas by the same man. The first one was the State irrigation board's report, which was provided for by the action of the State legislature of Kansas and appropriations made by that legislature. I now read from the book last mentioned at page 93:

"During this same week Bear creek, to the south of the Arkansas river, a stream usually entirely without water nine-tenths of the year, was out of its banks nearly the whole time. To properly understand the conditions here a few words must be said in explanation. Bear creek rises in southwestern Colorado, passes across the Kansas line and ordinarily entirely disappears in the sand hills south of Hartland. Throughout a part of its course it has a channel with a bank on either side but in the vicinity of Hartland the banks gradually diminish in height until they entirely disappear and the channel of the stream a hundred miles or more in length simply ceases to exist. On this particular occasion the rains in eastern Colorado and western Kansas produced a great flood in Bear creek.

The following description is taken from a letter received from Judge W. E. Hutchinson, of Ulysses, Grant county, Kansas:"

2266 It describes the flood, its quantity of water and behavior. It is incorporated in his subject, and that forms the substance of it. The point of value, I think, in this connection is showing the amount of water that comes down there and disappears in those sand hills. I may omit the first part which describes the flood and go to the description of Bear creek at its lower end:

2267 "Bear creek has a well defined channel from the State line to the sunk well at the south side of the sand hills, seven miles south of Hartland. This well, which is simply a depression in the sand hills and in the coarse sand, was never known to have been dry until about two years ago. The level of the water, however, in this depression, is usually about six feet below the bottom of the channel at that place. From the sunk well on through the sand hills is a winding channel, which one would scarcely think was intended for a channel of a stream until he should see water coursing through it, as we did this summer. The water ran past the sunk well—the usual terminus of the stream in times of ordinary floods—clear through the sand hills to the last ridge of them next to the Arkansas river, through which ridge there seems to be no opening whatever for its escape. It spread out east and west in irregular shapes, as it could find openings between the ridges of the hills, for probably a mile and a half or two miles wide, and it is safe to say was in some places fifteen to twenty feet deep, as is now made very apparent by the marks washed out and the drifts left on the sides of the hills. Not a drop of the water escaped into the Arkansas, and after the 25th of July, when the flow down the channel ceased, the water stood and remained in the channel and elsewhere in the sand hills the same as it did in the basins and lagoons on the uplands. It was not long, however, in drying up in the main channel of the stream. Out on the uplands, especially in basins, the water stood for several weeks. In the sand hills there is water standing now (December 27, 1895) in some places. Eleven years ago there was a similar overflow of Bear creek which spread over the uplands, we are told by the cattle men who were then in this country, and ran past the sunk well into and nearly through the sand hills, as at this time."

In the University Geological Survey of Kansas, volume II, page 23, there is one more sentence that is given by Professor Hayworth. He says:

"During times of heavy rains in eastern Colorado and western Kansas Bear creek carries a large volume of water, which it pours out upon the high plains of northern Grant county, and into the sand hills along the south side of the Arkansas river."

The White Woman, on the north side of the Arkansas river, is a stream of much the same character and terminates in the

2268 plains up near Scott City. It has no visible outlet into the river and does not come as near to the main river.

Many of the witnesses for Kansas spoke of wells, the water in which they believed to be on a level with the water in the river. Many of the wells mentioned by the witnesses were stated by them to be filled up, and so we have not been able to measure the water in them. We have made some measurements and run lines of levels and dug wells in places to determine the slope of the water surface in a portion of the regions mentioned by those witnesses. The area of country, however, covered by the witnesses, was so great in length along the river and in distances from the river, that we have not been able to cover it all as yet. We have not yet
2269 tested any particular well of those mentioned. We have been able to determine as to the levels in the location of some of these wells by contour maps of the Government. There was a well mentioned in Scott City where the witness stated that the water was about twenty-eight feet from the surface, and which he thought was on a level with the Arkansas river. The level of Scott City is, as I recollect it, two hundred and seventy-five feet, by railroad surveys, according to Gannett's Dictionary of Elevations, above Garden City, and Garden City is a little above the river. In the vicinity of Colwich and Mount Hope, Kansas, we have run lines of levels and have sunk wells down to the water. (Objection.) I have directed where the wells should be sunk, how they should be sunk, and at what particular points, and what methods should be used in making the tests, and the persons doing the work were acting
2270 under my direction and reporting to me. It would be a physical impossibility for me or any other one man to make these investigations as they should be made and complete them within the time limit within which Colorado or any party to this suit has been limited in the taking of evidence.

In regard to this underflow, so far as we have been able to get at the facts from the measurements we have made, I have thought that the witnesses were mistaken in their supposition that the ground water was level with the river. (Objection.)

2271 Referring to Gannett's Dictionary of Elevations, which I now have at hand, I find the difference in elevation between Scott City and Garden City is one hundred and thirty-five feet. The elevation of Garden City is given as 2,836 feet, and of Scott City as 2,971 feet, as shown by Gannett's Dictionary of Altitudes, which is recognized as a standard authority. It is published by the Interior Department of the Government. From the investigations which I have made, the Government cross-section maps and
2272 all other information now at hand, I have arrived at the conclusion that that which was commonly called "underflow" by the witnesses in Kansas during the hearing in this case, and which I have designated as "ground water," draws most of its supply from the rainfall, while some of it comes from the river. (Objection.) In these conclusions in that respect I agree with
2273 Professor Hayworth of Kansas, and also with Hay, Follett and others. While I am not now prepared to give a conclu-

sive answer on the matter as to how far the river has any material or marked influence on the ground water, I will say that we have found at a distance of a few hundred feet that the ground water has risen subsequently to a rise of water in the river. That this is due to the actual flow of water from the river is, however, not evident, in fact I think it is not the case except to a very partial degree. At a little greater distance we have found wells ceased to show the influence, and in fact the effect from the river decreases as the distance increases. As to the effect of the river upon the water in the holes so close to the river, some of the water from the river, as it disappears, flows sidewise and acts partially as a dam to the water running into the stream, just as the salt water acts upon the fresh water flowing into the sea. The slope of the country, generally speaking, is toward the river, and the ground water in the soil would be moving down hill, which is the way the water slopes; that is, toward the river and with the river, and when the river would rise
2274 that would act as a dam in backing up this water that is moving toward the river, and that for a short distance back would be evident in holes which had been sunk to water in the soil. We are still carrying on these investigations as rapidly as our facilities will permit.

Speaking of the effect which the using of water for irrigation of lands along the Arkansas river in Colorado has upon the ground water along that river and lying back from it in Kansas, I will say that the water being applied for irrigation in Colorado is tending toward the river the same as if there were an excessive rainfall. It is, then, keeping the sand saturated, whether it is in the river or in the sands outside of the river, and if that water is going down-
2275 ward it of course is adding to that supply. If the water flowing in the Arkansas river in Colorado were allowed to go straight on through Colorado along the channel of the river I don't think it would make any difference in the water level in Kansas when you get away from the immediate banks of the river. From my own investigations and the investigations conducted under my direction and those of others it is not my opinion that what is spoken of as the "ground water" or "underflow" in Kansas is water flowing in well-defined channels; it is simply water oozing through the layers of sand and percolating through those interstices. Even immediately under the bed of the stream it would depend on what we would call an underflow as to whether the water there found could be so designated, but there is nothing that I have ever seen that would make that appear to be a channel in the sense that you sometimes find in a more humid country or elsewhere where
2276 you may dig a well and cut a vein of water. Some might call the water immediately under the channel of the bed of the river, as at Dodge City, an underflow, but I mean that the water would be moving down hill, and the surface slope is down the river, so that under all the laws of gravity there would be an exceedingly slow movement there as there would be on the side. It is a move-

ment, though it is slow—a few feet per day. It is a flow that is under the surface, where there is sand and gravel. I do not even think that it would be any better defined in its direction and boundaries than the water you would find underneath the surface after you went back from the channel of the stream. The water flows in a way which is indicated by the surface, whichever way the fall is, and the fall is as definite outside the stream as it is there
2278 under the stream. From investigations we have made we have the level of the ground water at several places along the Arkansas river in Kansas. I had a line of wells run at different places at as near right angles to the river as the roads would
7779 permit; then to ascertain the height of the ground water wells have been bored down below the level of the ground water and the height of the water in these wells was determined at that time and at regular intervals afterwards. (Objection.) At Mount Hope, Kansas, a line was run north and south for a distance of six miles. This is a little west of Wichita and covers or goes into a portion of that delta lying between the main river and Little Arkansas river. While the height of the water at the river on August 26, 1904, was 3.49 feet, at 150 feet north the level was 3.63 feet, from the same datum. At
2280 660 feet, which is one-eighth of a mile, practically, 3.46 feet was the height of the water; and at 2,640 feet, about half a mile or approximately, the surface of the water was 5.03 feet, or one a half feet higher than at the river. At one and one-eighth miles the surface of the water was 7.14 feet, which was three and one-half feet higher than at the river. At two and five-eighths miles it was 11.49 feet, or eight feet above the water in the river. At 4½ miles it was 15.11 feet; at 6⅛ miles it was 17.63 feet. Opposite Colwich another line was run across the river, north. This crossed the river a mile east of Colwich because of a bridge being convenient at that place. It then passed through Bentley and passed by places which some witnesses have testified about. On August 27, 1904, while the height of the water in the river was two feet, 200 feet north of the river it was 1.78 feet, an amount slightly less, though the observation at that point was defective because of the newly sunk well and because the water had not been given sufficient time to rise. At ⅝ of a mile the height of the water was 3.29 feet; at 1⅝ miles the ground
2281 water was 6.80 feet; at 3⅛ miles it was 11.70 feet, or 9.7 feet above the river. At 4½ miles it was 14.95 feet, or nearly 13 feet above the river; at 6⅝ miles it was 13.70 feet, or nearly 12 feet above the river. The well 3⅛ miles from the river is close to the town of Bentley and is at the corner of the tract mentioned by Mr. Hansen, a witness of the complainant at Wichita. We are running still other lines and taking measurements and levels that are not yet completed.

I will explain a little more fully what I meant as to the river water acting as a dam to the ground water or sheet water as it comes in from the outlying country to the river. I mentioned heretofore that the water flowed down hill where the "down hill" might indicate

the surface of the water underneath the ground and not the surface of the ground. If, then, from any cause, the water is
2282 raised at the mouth or the mouth is elevated, it decreases the slope and the flow is correspondingly checked. Now, that decrease of slope might be effected by water acting practically as a dam at the mouth as well as by anything else. So it is rather a check. The term "dam" may be misunderstood as it is not an actually impenetrable obstruction. But it has the effect of decreasing the flow of the water, and so long as the water at the mouth of the river, for instance, is higher than the ground water in the adjacent sands, of course there will be a reverse current and the water will flow for the time being from the river into the sands. so that we have the water coming down the adjacent land into the sands and also running from the river back into the same sands. The combined action of the two gradually raises the ground water both ways in the immediate vicinity of the river. Now, we have numerous observations that illustrate that, and one I have selected this morning, almost at random, from the data I have. I have platted here the cross-section of the ground water at one series of wells at
2283 different times since the latter part of August. I have here a diagram marked Defendant Colorado's Exhibit 27. The horizontal distances are shown horizontally on the scale and the squares represent one hundred feet horizontally. The distances are shown on the lower line in figures; that is, 200 feet, 400 feet, etc., measured from the river. The vertical scale is exaggerated, as is commonly done in representing a cross-section or profile, and every square represents one-half of a foot. The actual elevations above the assumed reference line are given at each
2284 side of the diagram, as 1, 2, 3, 4, and 5 represent feet above the reference line. The bank of the river is assumed to be at the place marked zero toward the left hand side. Then in this case, in this series of observations, several swells were placed, one at five feet from the river, one at two hundred, one at eight hundred and one at eighteen hundred feet. They are shown by circles on the lines. Our records were made after August 29th daily or semi-daily until practically the first of October, 1904. Records were ag-in made on October 6th and 7th. I have taken the result of those measurements at four different times from August 29th up to the last of September, and then on October 6th. The reason for my taking them on October 6th and again beginning measurements at that time was because of the high water in the river which came a day or two before that. Dots were made on the paper showing the heights of the water found at those particular times, the dots and lines being drawn through this particular point. They are dotted in different ways, and the date is shown on the diagram. The upper line, which inclines
2285 to the right, shows the height of the ground water on August 29, and the inclination of the line shows the inclination of the ground water. In other words, it was higher at the well eight hun-

dred feet from the river than it was at the river itself. (Objection.) The heights of the water in the intermediate wells are shown at the intermediate points, and in each case at the first date they are higher than the water in the river. The second line shows the corresponding fact on September 1st, the third line for September 5th, the next line for September 8th, and the bottom line for September 12th, and all of them show a slope of the surface of the ground water toward the river. Then on October 6th, which immediately followed the flood of early October, we have a corresponding series of measure-

ments made at the same wells. On that day the river was
2286 high—at an elevation of four and a half feet, very nearly.

The first well shows a rise, so does the second, while the third and fourth have been going down continuously during the month. They do not show any effect from the elevation of the river. The diagram then represents the statement previously made, but the water from outside is still sloping towards the river as it is between wells at eight hundred and eighteen hundred feet. The water is still sloping from the outermost well to the next to the outermost well, although from there to the river the slope is a reverse slope, from the river to the well. This reverse slope is accounted for by the rise in the river which took place at that time from exceedingly heavy rains—floods in the river above. As the river would go down the ground immediately adjacent to the river, which has been filled by the water running from the river, again drains out. That fact was shown by the five lines which are on the diagram at present, the five lines showing a gradual

lowering of the surface of the ground water or water table
2287 from September 1st to September 12th, and also for the intermediate days, but they are not shown, on account of the confusion it would cause in the diagram. On August 29 the well 1,800 feet from the river had water in it which was 1.8 feet higher than the water in the river. On September 1st it was 2.10 feet higher; on September 5 it was 2.26 feet; on September 8 it was 2.13 feet; on September 12 it was 2.07 feet. These heights are the heights above the water in the river. That shows that the river fell faster than the water in the region outside.

(Defendant Colorado's Exhibit 27 offered in evidence. Objection.)

2288 Referring to crop conditions and the production of lands along the Arkansas river in Kansas, I will state that we have at hand the complete agricultural reports of the State of Kansas, which we have examined. The Solomon river is one from which no water is taken for irrigation unless in an extremely small quantity, and I think there is none at all; and this is also true of
2289 the Smoky Hill river. These streams rise in Kansas and there course is almost entirely in that State. I have taken from the statistics of the State of Kansas, as prepared by their State board of agriculture and published in their annual or biennial reports, the production of the various staple crops, and made calcula-

tions for the purpose of comparing the increase or loss in production per acre in the counties in Kansas along the Arkansas, Smoky Hill and Solomon rivers. These statistics are gathered by the secretary of the board of agriculture of the State and are made quite complete. I believe they are published under authority of law in the State of Kansas, and it is so stated in the volumes. I have compared the productions of corn and of wheat in the counties along the three river valleys mentioned and have especially compared the counties that were similarly situated with respect to longitude,
2290 so that they were under essentially the same conditions as to rainfall and most physical conditions, only that one set of counties was in the Arkansas valley, one set was directly north in the Solomon valley, and one set directly north in the Smoky Hill valley. I have produced three graphic maps of the figures taken from those reports. First, of the winter wheat. (Objection.) The figures shown on these various diagrams are accurately taken from the Kansas reports to which I have referred and the computations are correct. The three small prints or tables give in figures the results and actual figures from those reports, and at the bottom of each
2291 column is given the volumn of the Kansas report and the page or pages from which they are taken. These have been gone over twice, so that I think it is a correct transcript of the figures given in the reports. These tables are arranged to show the yield for each year and each county, and taking the Arkansas river counties, starting from Hamilton county on the west, we have here the yield of winter wheat as given in that report for the first year when that figure is given, which in that particular case was 1888. So for Kearney, Finney, Gray and on down to Cowley county on the south border of the State. Nearly all of the reports from which these were taken were biennial reports. Starting from 1877 the State seems to have printed its reports biennially; before that annually. The same kind of a diagram is given for the Solomon River valley, that is, for the different counties that are in the Solomon River valley, including both forks. This table starts with Thomas county, Sheridan, Decatur, Norton and other counties
2292 down to Ottawa; and similar figures are given on the next diagram of the counties in the valley of the Smoky Hill. Attached to these three diagrams is a graphic map reducing by that method of illustration the facts shown by the figures in the three diagrams just described. The diagram on the map attached shows two things—it first shows those tables in a graphic form by lines instead of figures, showing the ups and downs from year to year; and secondly, it shows the location of these counties by a map on the side of the diagram. It shows the State of Kansas, and shows these various groups outlined with a little heavier borders so as to indicate what counties are referred to in speaking of groups 1, 2 and 3. The graphic map to which I have just referred and the three diagrams constitute different parts of a whole and should be kept together as one exhibit.

2293 To explain more fully this map and diagram, I will state that the groups of counties which are shown in each of these drainage basins as groups 1, 2 and 3 were so arranged as to bring together the substantial facts shown by the tables without too much confusion. The counties in the extreme western part of the State in each of the valleys—the Smoky Hill, the Solomon and the Arkansas—were termed group 1. That set of counties which had an eastern border practically in the same north-and-south line—this took in the eastern border of Gray county and Finney county in the Arkansas valley. In the Smoky Hill and Solomon valleys it took the counties directly north of this set of counties. Their eastern line was within six miles of being directly north. The second group of counties in the Arkansas valley took in Ford, Kiowa, Edwards and Pawnee counties. The second group in the Smoky Hill valley took in the ones directly north as near as could be, that is, Trego and Ellis counties; and on the Solomon river the four counties directly north. The third group was formed in the same way, taking Barton, Rice, Stafford, Reno and Harvey counties on the Arkansas river and the counties similarly
2294 situated on the Solomon and Smoky Hill. The counties were then grouped and three sets of diagrams made, which are shown on the chart. The chart simply represents in graphic form the figures of the table. At the top of the diagram are shown the years. At the left hand of the diagram is shown the number of bushels per acre, so that for instance where a yield of twenty bushels to the acre, say in 1891, is to be shown, the point will be taken at the intersection of the line for 1891 and the line representing twenty bushels to the acre. A line is drawn through the different points representing the yields of the different years, so that the fluctuation of the line up and down shows the fluctuation of the yield of winter wheat, which is represented in this set of diagrams. Hence the three upper lines in the exhibit show the corresponding facts for the three groups of counties called group No. 1 in each of the three valleys. The middle set of three lines shows the corresponding variation in crop yield for the second set of counties, or Group No. 2, and the third set of three lines shows the corresponding variations of yield for group No. 3. Hence if the lines vary up and down nearly all alike it shows that the yield of crops in the
2295 three sets of counties, or the three river valleys, varies correspondingly; and it will be noticed in the diagram that there is a remarkable parallelism of the lines representing the yield of crops in the corresponding group of counties in the three valleys—that if one runs up so does the yield in the corresponding set of counties in the next valley. The lowest line represents the fourth set of counties in the Arkansas River valley. That is alone because of the fact that there is no corresponding group of counties in the other water sheds. As a whole, while there is a great variation in the yield, taking the same set of counties through a series of years, it is also evident that the same fluctuations of yield take place in

the other water sheds as in the Arkansas valley; and as said, the other streams have not been interfered with by taking water from them for irrigation. They are Kansas streams. These facts would seem to show that whatever causes the fluctuation in the yield of crops in the Arkansas valley has had the same effect on the
2296 yield in the Smoky Hill valley and in the Solomon valley. (Objection.)

(Defendant Colorado's Exhibit 28 offered in evidence. Objection.)

Three diagrams and a map, marked Defendant Colorado's Exhibit 29, are prepared from the same agricultural reports of the State of Kansas, in the same manner, for groups of counties in the valleys of the Arkansas, Smoky Hill and Solomon rivers, and show
2297 the same general facts as to the corn crop in those valleys. The diagrams on the same group of counties show remarkable
2298 similarity. (Objection.) If one goes up, indicating a large crop, so does the corresponding line for the other river valley; and if the crop goes down in one valley it also goes down in the other valleys. They are so remarkably similar that it would make very little difference which one of the diagrams representing the yield was taken—that is, the diagram representing the yield in the Smoky Hill valley is almost identical with that in the Arkansas valley. It makes very little difference so far as the character is concerned. (Motion.) In the graphic map, Defendant Colorado's Exhibit 28, and also Exhibit 29, if the line goes up it indi-
2299 cates an increase in production; if it goes down it indicates a decrease. (Objection.) And as I was describing the diagram I spoke then of the lines going up or going down. Those expressions would be synonymous with the increase or decrease of the yield per acre. (Motion.)

2300 I am familiar with the general character of the construction of the dams along the Arkansas river in Colorado which are used for diverting water from the river into the head works of the various ditches. They are all of the type that would be
2301 known as a diverting dam. Their purpose is simply to enable the canal to take water at the time when it is needed. It is not a storage dam as is a reservoir dam. They are all of them overflow dams or what some would term wiers; that is, the water runs over the top of the dam. It simply holds the water there to force it into the canal. It does not prevent the water from passing by. It raises the bed of the river possibly a few feet and that is all. Take the Fort Lyon or Amity dam, they carry over their tops all excess of water, as in the case of the recent floods, which ran up into thousands of cubic feet per second. These dams run from three to seven or eight feet in height. When the river rises the surplus water simply proceeds on over the dam and down the river. Then in addition every canal in the State, almost, has a waste-gate. In regulating the in-take into a canal the large amount of water which may be in the river renders it sometimes impossible, almost,

to regulate it. There is a set of gates next to the river itself and these can be raised or lowered so as to regulate the water to some extent, but they cannot get just the exact amount of water at that place, and so below there is almost always placed a second set of gates which are waste-gates for running back to the river
2302 the excess of water. These are sometimes combined with sand-gates and sometimes they are in separate structures and sometimes are the same structures. The sand-gates on the Arkansas river are for the special purpose of clearing the upper canal of sand. On a sandy river like the Arkansas a great deal of sand is apt to enter the canal and cause much expense in cleaning it out. In nearly all cases these waste-gates are within a half mile of the headgate. They need to be above the rating flume, and with the exception of one or two in the State they all are. When these waste-gates are opened and the water passes through them it goes back to the stream from which it was diverted. In some cases in the State the canals are permitted to run water through the head-gates and back through the waste-gate, even when it does not run down the canal, as a means of keeping them free from sand and keeping the sand from accumulating in front of the gates. That is what sometimes gives rise to the name "sand-gate."

2303 Complainant's Exhibits A–15 to A–38, heretofore introduced in this case, consist of tables showing various ditches, their priorities, the number of days water has been running in them, and certain other things. They are all of the same general type. They are a portion of the reports prepared by the water commissioners, first to the superintendents of irrigation, and then transmitted to the State engineer. They are not their complete reports but give the tabulations which they made from the data they had. They obtained the material for these reports from different data they may have had, but in almost no case that I know of in this
2304 State have they gone into the work of getting these statistics very carefully. In these tables is stated the number of days in which water was carried, and there is also a column giving the average amount of water carried during the season in second-feet. The season to which it refers is the season during which water was carried, and the average amount of water is the average amount carried during the number of days which is mentioned and not for the whole reason. In some cases the totals at the foot of the column give the sum of the number of days of all the different ditches, so that in the first table that is before me the totals show 1,693 days during the year in which water was carried, which of course in the sum of the number of days for the series of ditches. The corresponding totals are on almost all of the other diagrams. The group of exhibits last referred to does not show nor pretend to show anything like all of the ditches taken from the Arkansas river and its tributaries in Colorado. These tables that were submitted are only for districts 14, 16 and 67, I believe. There are a good many other dis-

tricts in the Arkansas water shed, some on the Arkansas itself and some on its tributaries.

2306 Recurring to the movement of ground water in the Arkansas valley in Kansas, the slope of the river there is moderate. The sand is of fair size, the velocity of the water through the sand is probably 6 to 12 feet per day—on an average perhaps 8 to 10 feet. I have made investigations for the purpose of determining the movement of underground water. The experiments which I made prior to this year were largely made as laboratory experiments to get at the laws of flow, and the flow as relating to the slope of the ground surface and the size of the particles—to get the general law—and the results of those experiments have all been published

2307 some years ago in Bulletin No. 33 issued by the United States agricultural experiment station heretofore referred to. That has been used quite extensively in various works and discussions on the subject elsewhere.

Speaking of the movement of ground water through sand and gravel such as is found in the Arkansas valley in Kansas, if we assume a speed of ten feet per day, which is a fair assumption, and probably above the actual fact if anything, then to get at the quantity we would need to know the area of the cross-section. If it be considered as half a mile wide and 100 feet in depth, that would be an area of a trifle over six acres in the cross-section, because 100 feet is six rods, practically speaking, and then the quantity of water passing that cross-section of six acres, with a velocity of 10 feet per day, would be 120 acre-feet within the day, for half a mile each side of the river, and this expressed as rate of flow would be supplied by a flow of 60 cubic feet per second of time, and that proportion of discharge would be maintained if you increased the size of

2308 the cross-section. Then if you took a cross-section half a mile wide and 100 feet deep, assuming the sand and gravel to be of the character just mentioned, the discharge would be 30 cubic feet per second of time. I think the rate of travel which I have given for underground water agrees with the results which have been reached by scientific investigators such as C. S. Schlichter of the experiment station of Wisconsin and more recently of the Geological Survey.

Defendant Colorado reserved the right to call this witness later on for the purposes of further examination when the uncom-

2309 pleted investigations mentioned in his testimony should have been concluded. Further direct examination will be found at page 6831 of the record.

Complainant also reserved the right to cross-examine the witness at a later date, which is found on page 2566 of the record.

2313 T. C. HENRY, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I am 63 years of age, reside in Denver, and my occupation is irrigation and real estate. I am a native of the State of New York, but I lived in the State of Kansas from 1867 to 1883 at Abilene, Dickinson county, Kansas. During my residence in Kansas I was engaged in the business of farming, real estate, and banking. I located in Kansas, as I said before, in 1867, and made my first purchase of real estate and commenced farming operations the next year, 1868, at Abilene. Those operations in that year were confined to breaking operations, and what we call sod crops.
2314 That year I planted sod corn and potatoes, both on sod land and some old land. The crops were a total failure. The cause of that failure was drought and hot winds. During that year the supply of moisture was perhaps 50 per cent. below the average for that section of Kansas and there was practically no precipitation after about the middle of June until late in August, consequently in August the hot winds occurred and we lost the crops. We also had some grasshoppers, but too late to do any damage to those crops. In that year I had about 200 acres of sod corn and I think only three or four acres of potatoes. Abilene is situated in the Smoky Hill valley, and my farming operations reached
2315 within a mile and a half of the border of the stream. In 1869 I farmed the land that was broken the year before and made some extensions to my operations. During that year I raised about 200 acres of corn, perhaps about 50 or more acres of oats and a few acres of potatoes,—five acres or so. In that year I had very fine crops of all kinds. It was a wet year. The average precipitation was at least thirty or forty per cent. above normal. The precipitation was so great that for instance parts of the Smoky Hill valley were overflowed, and the town of Abilene was overflowed. Consequently there were no hot winds and we had no grasshoppers. In the year 1870 I farmed, in acreage, rather more than the year previous, and about the same quantity of crops and the same diversity as before. The rainfall was again much below the
2316 average, about the same as in 1868. The results were about the same—that is, there was a total failure in that section of potatoes, spring wheat, and all but very early corn. The prairies in sections of our county and farther west, the same as in August, 1868, burned over in places, it was so dry. 1871 was a wet year. There was not quite as much precipitation as in 1869, but it was a very favorable year for agricultural operations, perhaps one of the most favorable within my experience in Kansas. There were no hot winds and no grasshoppers. Full crops were grown. Probably all together I had

500 acres under cultivation that year, two thirds of it in corn and the balance divided between oats and potatoes. In 1872, the early part of the year was rather above the average of normal precipitation. Later in the season there was a deficiency of moisture
2317 and consequently the earlier crops were successful. The late corn crop was below the average, but was a fair crop—perhaps half a crop. I had just about the same number of acres under cultivation as the year before. 1873 was very much like the year previous, perhaps, in the earlier months of the season. In the later months of the season there was less precipitation than the year before and corn was a total failure; that is, the corn that matured in August. July corn was a pretty fair crop. The small grain crops averaged fairly well, perhaps about 80 per cent. of a full crop. I myself had no wheat in that year. In 1874 I increased my farming operations. All together I was farming eight or nine hundred acres. I grew 500 acres of winter wheat in 1874. The season was very much below the average in precipitation, and in fact the most disastrous year in all my experience in Kansas, because of the lack of
2318 precipitation, the hot winds, and, later, the grasshoppers. But I raised a fairly successful crop of winter wheat, it being matured too early to be affected by the summer drought, and in that way established the adaptability of that section of Kansas to the growth of winter wheat. It was the introduction, perhaps, of the industry. As the result of my experience as I have detailed it, for several years prior to that time I was convinced that that section of the State, say from Fort Riley westward, was not a corn country, nor was it a spring wheat country, because spring wheat matures later than winter wheat, and consequently that the crops grown theretofore were not sufficiently successful to warrant our claims for that section of Kansas being a desirable agricultural section, and being a large holder personally and also agent for the Union Pacific Railroad Company, which had large bodies of land grant lands for sale, it was a matter of some considerable concern to me as to what should be done in order to maintain a living by those whom
2319 we were proposing to settle, occupy and improve all that enormous territory, and I had already reached the conclusion, as I have stated, that some other system of crops or culture should be introduced in order to sustain a population by agriculture successfully, and I began as early as 1871 on those lines and made trips in various parts of the State, and in the eastern scetion particularly, and here and there I came across now and then a small tract of winter wheat. Sometimes it was a failure and sometimes a success; and I collated and compared the experiences of those with whom I became acquainted who were so growing wheat and decided by 1873 to engage extensively in the growth of winter wheat and in such a way that it might advertise, if successful, that industry and encourage western Kansas to adopt the growth of winter wheat, and consequently I selected a particular section of land in the valley of Smoky Hill, nearer the river than my original tract and adjoining

the railroad, and broke it in the usual simple way, and seeded it at a different period and in a different way from what had been adopted and practiced, so far as my observation went. This was in the fall of 1873. And as I anticipated, it proved a remarkable suc-
2320 cess. It was a veritable oasis, and being an extensive field for that new country, located along and adjacent to the railroad, it attracted the attention and became the advertisement that I had planned for from the start. I may say there was much ridicule, perhaps, indulged in, because the theory was then that fall wheat required a winter climate more severe than that of Kansas. That I proved was not the case, and of course subsequent experience has carried the growth of that sort of wheat, as I have seen, away down into the central part of Texas. By a more severe climate I mean more winter—a lower temperature. The snow fall protects it in the event that because it may be dry in the fall of the year a small growth is obtained, but if an average growth is obtained in the fall it is not at all essential to have any protection by the snow. The snow is valuable simply so far as it contributes to moisture. In the spring of 1874 I broke up 1200 acres additional adjoining
2321 the 500 acre tract, and I seeded that in the fall of 1874. The moisture was very favorable as to quantity and a very fine stand of wheat was obtained: The result was that in 1875, as the moisture for that year was above the normal, we had a magnificent crop, the largest yield per acre in all my experience in Kansas. I think the production averaged over 30 bushels to the acre and the price realized was over $1.20 per bushel. There were no hot winds and no grasshoppers that year. All kinds of crops were flourishing.

In the spring of 1875 I broke up about 2,000 acres additional and adjoining the previous tract and seeded it in the fall of 1875. 1876 was a very wet year, I think the wettest, with one exception, in all my experience in Kansas, almost too much so for grain. I lost a good deal from overflow and too a rank a growth of straw and a slight trouble with rust. There were no hot winds, therefore, but we had grasshoppers that came in from the northwest in the fall of 1876 and affected our seeding. Crops of all sorts were good, unless they were injured by too much moisture. That year I had in the valley of the Smoky Hill about 5,000 acres in crops, almost wholly in winter wheat. During that time I farmed also in various
2322 valleys in the county on tributary streams. I was farming in the lower Solomon valley and in the valleys of Turkey creek, Holland creek, Chapman creek, and Mud creek, which are tributaries of the Smoky Hill, and on the uplands more or less between those streams, scattered over an area of perhaps thirty or forty miles square. I think I was farming besides the tract I spoke of, perhaps four or five thousand acres. Much of that was in corn. The corn was a very fine crop.

2323 1877 was another year that we would call a wet year, not quite so much precipitation as that of the previous years, as I now remember, but a very successful year for agriculturalists.

Crops of all kinds averaged rather better than in 1876, even, except in certain sections of our country where the grasshoppers in the previous fall had deposited their eggs and the young grasshoppers hatching out in the spring of 1877 destroyed some wheat crops. Most of the injury, however, to my wheat crop, grew out of the fact that I was compelled to postpond my seeding the fall before until a late period—as late as November—but most of the wheat as it sprouted out of the ground was eaten off by grasshoppers as fast as it appeared. The result was that wheat the next spring started late, and the season being wet, it made an enormous growth of straw. But the crop itself was about three weeks late, and as the moisture continued during the season, with mucky weather, the conditions were favorable for the introduction of rust, and the 5,000 acre wheat field that I had in the Smoky Hill valley was really a total failure,
2324 being struck by the rust, though I harvested it and kept still.

That year I had about 8,000 acres of wheat and about 2,000 acres of corn, and the balance was divided between crops of millet and oats.

During the year 1878 my acreage in the valley of the Smoky Hill was somewhat increased. I think I raised about 6,000 acres of wheat, possibly 7,000 in that valley, and about 3,000 acres in other parts of the State, and of other crops perhaps 5,000 acres more—possibly about 15,000 acres all together in 1878. It was a very wet year. My recollection is that there was more preciptation during all of the months of the summer that year than any year previous in my experience in the State, and consequently crops of all sorts were very fine. We had no hot winds and no grasshoppers.

1879 was a dry year—a very disastrous year. I think my farming operations caused me a loss of seventy-five or a hundred thousand dollars. Wheat was almost a total failure, corn was almost a total failure, and other crops were a failure. The failure of the normal sufficient amount of precipitation accounted for most of the
2325 loss, except as to winter wheat. That grew out of a blight, a disease that we never could understand the cause of, though the crop loss was affected somewhat by the extraordinarily dry weather. We had some difficulty late in the fall previous in getting the wheat started early enough, and it was a very dry spring, and the wheat crop was not a success from the very start. Of course the corn was what we would call a failure, though not a complete failure. As to whether my farming operations during that year were confined to the valley of the Smoky Hill or extended to other valleys, they were just about the same as I have previously described—less of farming operations in the valley than before and more outside. I began to sell off some of my valley land. When I say "more outside" I refer to the uplands and the valleys of the tributary streams. I went out into one or two of the counties adjoining. In 1880 I did much less farming. The precipitation was again much below normal and our wheat crop averaged low and corn was pos-

sibly much below average. Prices were low and the results
2326 were not at all satisfactory.

1881 was rather a better year, with more moisture. The crops were better but not up to the average, in our section. My farming operations were steadily being reduced as to acreage. I was steadily acquiring land but not farming it so much personally. The reason I reduced my farming operations and still kept acquiring more land was because of the failure and risks involved because of periodical droughts and lack of precipitation.

In 1882 my farming operations, in acreage, were much diminished, but it was a very successful year. We had more moisture. All crops were good, including corn, etc. I was farming that year in the Smoky Hill valley proper, probably not more than three or four thousand acres, and outside of that valley, in the district that I have spoken of, about 3,000 acres additional, or possibly 4,000.

2327 My farming operations in 1883 were about the same as in 1882—possibly less in the valley but a little greater out on the uplands and in the tributary valleys of the Smoky Hill. I am not quite so sure now as to that year. My recollection is that it was a very favorable year, with a full average supply of precipitation and full average crops, but perhaps not quite so much so as the year before. In 1883 I removed to Colorado, and in 1884 I had reduced my farming operations, giving them no personal attention, or barely any, and consequently I do not remember the years from that time on in Kansas. In 1884 I was back and forth, but not very much of my time was spent in Kansas. Since 1884 I have frequently visited Kansas. I retained large interests there for several years. After that time until 1888 I closed out practically all my interests in the State.

2328 As to the settlement of the country in and about Abilene, Kansas, we had the greatest immigration in that section of Kansas in 1870 that I ever saw in a single year, in fact prior to that time but very slight immigration had been secured. At that time the great stretches of the uplands were homesteaded and practically taken for a distance of 50 miles on either side of Abilene. The settlement was checked by the drought of 1870. The favorable years of 1871 and 1872 revived the immigration, of course most of it going much on beyond us, because our lands were occupied. The failures of 1870 checked immigration, in fact we lost thousands of families in our section of the State; but after the success of 1875, in 1876 and 1877 the immigration poured into that part of Kansas and assumed enormous proportions, which lasted for two or three years; but the failures of 1879 and 1880 checked it again and thousands of families moved out; and then the successes of 1882, 1883, and, I think, 1884, resulted in still larger immigration than ever before, the settlement pushing out to the extreme borders of the State; but the failures of 1885 and 1886 resulted in driving out of the State again thousands and thousands of families, although it did not affect particularly that portion of Kansas where I had lived.

2329 Abilene is located in Dickinson county, and I was familiar with the crops generally in Dickinson county and other counties in that vicinity, during the years covered by my farming operations of which I have just spoken. I made a very close study and observation of the matter. The crops in other portions of the county and in other localities were about the same as I have described my own crops. West of a line drawn along that degree of longitude, so far as settlement extended, the crops were a failure, and rather more of a failure as you went farther west, as there was less precipitation, and not so much of a failure as you proceeded to the east. As you approached the Missouri river the precipitation steadily increased and had its corresponding effect upon
2330 agricultural productions. I think it will be found upon investigation that the results I have described as to production in the various years named will correspond exactly with the experience in other valleys, including the Arkansas valley. I have no question but that my experience as described is an index to the experience of the farmers generally in that vicinity.

As to the location of Abilene, it is almost exactly, as I remember, due north of Wichita. It is just below the mouth of the Solomon river, which is a tributary of the Smoky Hill. The Smoky Hill valley extends east of Abilene to Fort Riley, where the Smoky Hill river joins the Republican, the two together forming the Kaw river. The Smoky Hill water shed lies northwesterly from Abilene and I think it is almost wholly within the state of Kansas. So is the Solomon water shed. The valleys are of about the same character as at Abilene so far as surface appearance—sub-soil
2331 and surface soil—is concerned, and so far as native forests are concerned, only narrower so far as size is concerned, until you approach the upper sources of the water shed. The Smoky Hill never goes absolutely dry. I have never seen it dry below a point about a hundred miles from its mouth at Fort Riley, but of course during those protracted droughts the stream is a mere rivulet. The Solomon is never dry, or I have never seen it dry, below a point 75 miles above its mouth. The Saline river, another tributary of the same character as to the water shed and climatic conditions and soil conditions, is a permanent stream at about 60 miles above its mouth, a point about 20 miles west from Abilene, and its water shed is entirely within the state of Kansas. The beds of these streams are sandy, about the same as the Arkansas, the banks not quite so high. The sub-soil is perhaps a little heavier—that is, a little more clayey, in these valleys than in the Arkansas, until you get to certain places in the Arkansas near the uplands, but
2332 not where there are sandy stretches bordering the Arkansas. The general conditions are about alike—I mean referring to the Arkansas, Smoky Hill, Solomon and Saline water sheds and valleys. These streams do not extend as far west into the arid region as the Arkansas. They are practically confined to the Kansas line and there is practically no irrigation from any of them.

I have seen two or three very small ditches up the Saline and Smoky Hill. They hardly amounted to an ordinary Colorado farm lateral. In the years when we had poor crops and also in the years of total crop failure that failure extended up to the margins of the streams in every instance.

I think I introduced the cultivation of winter wheat on a large scale in the State of Kansas. My farming operations were conducted on what we call the contract system, which I originated, and I introduced in connection with that system of culture the header and the first steam thresher—the modern means of handling large
2333 areas of grain. I first became acquainted with the Arkansas valley in 1868 where Hutchinson now is. From 1868 until 1883 I didn't see the valley of the Arkansas river more than a dozen times. As to the years in which I saw that valley, I am unable to particularize, perhaps, beyond two or three years. I saw the river, as I said, in 1868. I saw it in 1871, 1874, 1877, and 1880. I may not have these dates quite correct. I am sure from what I saw and from what I learned from those of whom I inquired that the crops on the Arkansas generally during the years of which I have spoken as dry years and wet years corresponded almost identically
2334 with my experience as detailed in the Smoky Hill valley. The farmers in Kansas in that locality, including myself, depended entirely upon the rainfall for the growing of crops. We knew nothing about irrigation. There was very much discussion during those years with reference to the rain belt extending westward. I heard of this almost from the time when I first went to Kansas. The theory was discussed because it was not very far from the disastrous experience of 1860, which was probably, aside from the grasshoppers, the most droughty year Kansas has seen since the settlement of that State, and consequently people coming into the State, having heard that, naturally would be more or less apprehensive, influenced by what they knew or had heard of the story of that failure. It began to be asserted, because there were several wet years following 1860 or 1862, that there need be no further apprehension as to a repetition of the experiences of the past and that the grass was changing, growing out of the fact, as it was claimed,
2335 that the buffaloes were driven away and that the impacting of the ground by countless buffaloes would no longer continue and it would open up the pores of the soil and the precipitation instead of running off would be absorbed, and that precipitation, being so preserved, would increase the evaporation, and that evaporation in turn would increase the precipitation, etc, etc., until agriculture would be as safe as in the older sections; that the building of railroads, the stretching of telegraph lines, the planting of trees and the plowing up of the prairie—all of these operations would result and had resulted in increasing the rainfall; and I will state frankly that I had no doubt that that was true for a few years after I first moved into the State. This was used as an inducement to promote immigration to and the settle-

ment of the country, very extensively, especially by the railroad companies in the sale of their land grants, and all of us boomed Kansas with that idea, who had land for sale. As I have stated, I had no doubt for some years of the correctness of that theory,
2336 but in 1876, at the request of the officers of the State historical society, the boards of county commissioners of the respective counties in Kansas were invited to select some person to write up a historical sketch of their counties so that such sketches might be deposited with the State historical society for future use. The county commissioners of Dickinson county designated myself. It devolved upon me, therefore, to inquire into the existence of those who had first settled our county, reaching back about ten years, and very much to my surprise, so far as the information could be relied upon as obtained, I found it was a fact that for the decade beginning with 1856 and ending with 1866 the rainfall was as a matter of fact much greater than from 1866 to 1876, reversing the increasing rain belt theory. Of course I was disappointed at the result and I embodied my conclusions in my sketch, which was delivered on the Fourth of July, 1876, and was published, and invited a criticism or criticisms that encouraged or forced me in self defense to make a still further study of the whole subject, and I finally reached
2337 the conclusion that if anything could be proven with respect to the rainfall of Kansas it could be proven that there was a diminishing rainfall and that there had been no flood—and there has not been one since—equal to that of 1844. The valley of the Smoky Hill in that year was submerged continuously for about 30 days from one bank to the other, and the flood at Kansas City was about 12 feet higher at the point where the Union depot is located than it was last year, 1903. The historical sketch which I have prepared, as stated, I saw for the first time since it was deposited in the archives of the historical society about a month ago. I know that it is there and is accessible at this time to any parties wishing to investigate it. It was published in the Abilene Chronicle and is among the files of the State historical society. I can give from
2338 memory the concrete statement made by me in this article. I stated therein that it was a certain fact that the total precip-
3838 itation—I quote from memory:

"Certainly the aggregate rainfall for the past ten years does not equal that of the ten years from 1856 to 1866."

2339 About the year 1880 there began to be more attention paid to the need of irrigation in that locality. I myself put in some wind mills and experimented on the uplands particularly, but no practical results ensued of any value. It was too expensive. The lift was too great. The quantity of water obtained in the fact of the enormous evaporation, the hot winds, the dry atmosphere and the parched ground made practical results of any value im-
2340 possible. We ran some levels with the idea of taking water from some of the tributaries of the Smoky Hill, but we found it impracticable to irrigate in this way. About that time some

Kansas people, particularly Senator Plumb, as I remember it, began irrigation development in a way out in the Garden City section of the Arkansas valley. The question of irrigation was quite generally discussed, especially following the years 1879 and 1880 and wide publication was given it. The press talked about it and par-
2341 ties who were interested in it personally in a public spirited way were devising some plan to remedy the moisture supply, and for those reasons quite a propaganda was maintained; but so soon as a couple of years of normal or super-normal moisture appeared, the proposition of irrigation was dropped.

The people of that portion of Kansas or some of them were at that time passing into Colorado and back again and the method
2342 of irrigation in Colorado was discussed. During those years from 1876 up to 1884 and 1885 I know that there were very many people who visited Colorado from that section of Kansas. The idea of irrigation was pretty generally promulgated, discussed and considered by our people as a remedy if possible, for the failures caused by droughts in the past. By that time the method of irrigation in the raising of crops in Colorado and other States of the arid region began to be quite generally known and spoken of in that locality. The result, however, of attempts at irrigation in that particular section of the State of Kansas was practically nothing.

In the Arkansas valley the conditions were rather more favorable.

2343 I know that a number of ditches were constructed in western Kansas for the purpose of irrigation looking to the Arkansas river for their water supply and that those ditches were not generally used for a number of years. The principal diffi-
2344 culty for the first decade or so after those enterprises were projected was the impossibility of finding customers for the water. People would not buy the water. They would secure large tracts of land, but were unwilling, and unable financially, perhaps,—and were unfamiliar with the subject anyway,—to buy the water, and that state of affairs has continued more or less up to the present time with respect to the canals in the Arkansas valley, pretty well toward the eastern section of the valley that is irrigated.

As to the settlement of the country in and about Lamar, Colorado, as I now recollect it, it was at the close of the wet period, beginning, perhaps, about 1885, when the rain belt theory was most prominent and had resulted in crowding settlement to the Colorado Kansas line, people began to move into the Arkansas valley in the State of Colorado, being encouraged to do so by those who were favoring the rain belt idea, and particularly encouraged by the Santa Fe Railroad Company, and a settlement under the auspices and direction of Kansas promoters and Kansas interests began at Lamar, Colorado, on the line of the Santa Fe railroad. I can mention some of
2345 those who were connected with that immigration in Colorado. One was Mr. Frost, who was connected with the land depart-

ment of the Santa Fe Railroad Company; another was Colonel I. R. Holmes, a land and colonization promoter, who I think originally laid out the town of Garden City, Kansas. As I now remember, Colonel Holmes was the most active man in connection with the movement that built the town of Lamar, Colorado, co-operating as he always did very closely with the officials of the Santa Fe railroad. He had special facilities for colonizing rates, concessions, etc. The Santa Fe Railroad Company at that time had large land grants undisposed of on the Arkansas river within the State of Kansas. Those lands in Kansas were riparian to the river,
2346 many of them. Colonel Holmes passed by those lands and fostered this immigration in Colorado. That was after the ditches were taken out within the State of Kansas, or after many of them had been constructed.

2347 I left Kansas and came to Colorado in 1883. The real reason for this change was the drought failures in Kansas—crop failures—that I had experienced. Crops in Kansas were so uncertain that I looked to a country where the water could be under control. I found that conditions did not improve as time progressed, so far as Kansas was concerned, where I was, nor that irrigation operations were any more successful than they had been before. The failures were too frequent and too serious for me to continue the large operations that I desired to conduct and had been conducting there. I became interested in irrigation in Colorado a few weeks after I located here. The first irrigation enterprise that I became connected with was at Grand Junction, Colorado, in the Grand valley.

As to my experience in building ditches in Colorado and elsewhere, I will say that the Grand valley enterprise covered about 40,000 acres of land and the canal was built proportionately.
2348 I raised the money and practically completed the system, involving an outlay of about $400,000. Since that time there has been expended perhaps a couple of hundred thousand dollars more on the canal system itself. The canal is about forty feet wide on the bottom, with a carrying depth of about five feet, and it is about forty miles long. The distributing canals had perhaps a total length of two or three hundred miles.

The next enterprise I became interested in was at Fort Morgan, Colorado, called the Fort Morgan canal, down on the south bank of the South Platte river, about seventy miles below Denver. It waters the Fort Morgan flats, in the center of which is the town of Fort Morgan. The canal is about thirty miles long and about twenty feet wide on the bottom at the head-gate, with a carrying depth of about four and a half feet, and irrigates about fifteen thousand
2349 acres of land. It cost all together about three hundred and fifty thousand dollars.

The next enterprises I was identified with were in the San Luis valley, namely, the Del Norte canal, the Citizens canal, the Empire canal, and the San Luis canal.

The Del Norte canal, the first one, is about 30 feet wide on the bottom and 110 feet wide on the top, carrying about 7 feet of water, with a grade of about seven feet to the mile for the first few miles—the largest canal in the United States so far as the quantity of water or its carrying capacity is concerned. It has cost all together, with the distributing canals, perhaps three quarters of a million dollars, and has a total length including main canals and distributing laterals, of perhaps five hundred millions.

The Citizens canal is about forty miles long and fifteen feet wide on the bot-om with a carrying depth of about six feet, the laterals amounting in the aggregate to about three or four hundred miles, and cost between four and five hundred thousand dollars.

The Empire canal is farther down the San Luis valley. It is also taken, as the previous canals are in that valley, from the Rio
2350 Grande river. It is 56 feet wide on the bottom, with a carrying depth of about six feet. It is about thirty-five miles long, the main canal, and has about one thousand miles of distributing canals under it. The total cost was about seven hundred thousand dollars.

The San Luis canal, from the same river, was fifty feet wide on the bottom, possibly, with a carrying capacity of about five or six feet, and a total mileage, including main and distributing canals, of about three hundred miles, and cost, all together, about four hundred thousand dollars. These canals were all constructed under my management. They were all built in 1884 and 1885, except some of the distributing canals needed for the use of farms brought under cultivation subsequently.

The next system was the North Poudre, taken out of the north fork of the Poudre river, northwest from Fort Collins. At the time I was connected with it, it was a canal thirty feet wide on the bottom and about sixty miles long, and, with distributing laterals,
2351 aggregating a couple of hundred miles. It was a very expensive undertaking. The original cost was about five hundred thousand dollars, and it has been extended considerably since constructed.

The Pawnee canal is located in the lower South Platte valley, on the north side of the Platte river, adjoining and tributary to the town of Sterling, in Logan county. It is about forty feet wide at the headgate and carries about five feet of water in depth, and the main line was about thirty miles long with perhaps one hundred or one hundred and fifty miles of distributing canals. It cost about two hundred thousand dollars and was built in 1884.

In 1884 we also — Uncompahgre canal, now called the Montrose canal, in Montrose county, the water being taken from the Uncompahgre river. It is about thirty miles long and has perhaps two hundred miles of distributing canals, a very expensive proposition, having cost more than a half a million dollars.

In 1887 I undertook my first pr-ject in the Arkansas valley. The canal is what is now known as the Fort Lyon canal. It is taken out of

the Arkansas river on the north side about two miles northwest from the town of La Junta, and in the course of two years it was
2352 extended so that the extreme length of the main canal was one hundred and seventeen miles. It has been subsequently enlarged, but not under my administration. At the time it was constructed it was about fifty feet wide on the bottom, with a carrying capacity and depth of something over six feet, and cost, originally, between four and five hundred thousand dollars.

My next enterprise in the Arkansas valley is the Bob Creek canal, known as the Colorado Land and Water Company's canal, the headgate of which is on the north side of the Arkansas river, about eighteen miles below Pueblo. As I recollect it, it is a canal about fifty feet wide, carrying a depth of perhaps five feet of water, and cost, under my administration, about three hundred and fifty thousand dollars. It was carried about sixty miles, and waters Sugar City and the territory tributary to it. It has subsequently been enlarged and is a much more ambitious enterprise now.

In 1890 I also undertook the Otero canal enterprise in the Arkansas valley. The canal is taken out of the south side of the Arkansas river at a point about forty miles below Pueblo. The main canal is about sixty-six miles long, and has a width at the headgate of about thirty-five feet, carrying four and a half to five feet in depth, and cost about two hundred and fifty to three hundred thousand dollars.

2353 I have now mentioned all the main canals I have constructed. I have been identified with some smaller ones, but comparatively small.

There were some Kansas people interested with me in the construction of some of these canals, in fact most of the capital employed in the Fort Lyon construction at the time I was connected with it was Kansas capital or capital belonging to the friends of Kansas people, including, principally, Topeka people—the Mulvanes, Senator Burton and others less prominent. I think there were no Kansas people identified with any of the others there; but during all these years the people of Kansas were taking a lively interest in the question of irrigation. I think the people of that portion of the Arkansas valley in the State of Kansas were more active and more aggressive in furthering irrigation development and talking irrigation than the people of perhaps any other State in the arid West. The
2354 Santa Fe Railway Company was particularly active. They went so far as to employ Judge Emery of Lawrence as a general solicitor on the subject of irrigation. He first acquainted himself thoroughly with the subject, and on nearly all occasions appeared advocating irrigation. A man by the name of Gregory was perhaps in some ways even more active than Judge Emery. Judge Emery was a resident of that part of arid Kansas, and Judge Emery was employed because of his ability as a speaker, while Judge Gregory had material interests at stake. E. R. Moses was another active man, very prominent in the work, chairman of the executive com-

mittees of the various congresses and active in that way. Mr. Mosel lived in Great Bend, Kansas.

These irrigation congresses that I have spoken of were conventions held for the purpose of discussing and furthering irrigation interests as a general proposition, and as applied particularly to the respective localities from whence representatives appeared.

2355 There was such a congress held in Denver, one in Ogden, one in Salt Lake City and one, I think, in Los Angeles, one in Phœnix, Arizona, and in other places. Kansas people invariably attended these conferences and advocated the cause of irrigation, with large and influential delegations. I think the idea which has culminated in the reclamation fund originated with Kansas people. This discus-ion and activity on the part of the people of Kansas in favor of irrigation covered the decade beginning I should say about the year 1890 and culminating in the act of Congress of 1902. I don't think Kansas has displayed so much interest, at any

2356 rate in the sessions of the irrigation congress held during the last two or three years, as it did prior thereto. (Objection.)

The Grand river, of which I have spoken, rises in the main Rocky Mountain range in Colorado and drains the west slope and runs directly west into the State of Utah (objection), thence westerly into the Colorado river, bordering the Territory of Arizona and the States of Nevada and California, and runs for a short distance

2357 through the Republic of Mexico and empties into the gulf of Mexico. (Objection.) Four of the ditches which I have described take their water from the Rio Grande river, namely, the Rio Grande canal, the Citizens canal, the Empire canal, and the San Luis canal in the San Luis valley. (Objection). The Rio Grande rises in the various Rocky Mountain ranges which form the water shed source of the Rio Grande in Colorado. It thence flows south through the Territory of New Mexico to the State of Texas and is the boundary line between Texas and old Mexico, and finally reaches the gulf of Mexico at Matamoras. (Objection.)

2358 Three of the ditches I have described take water from the South Platte river. They are the Fort Morgan canal, the Pawnee canal, and the North Poudre canal. The latter receives its supply of water from one of the tributaries of the South Platte river. (Objection.) The South Platte river rises in the Rocky Mountain range in Colorado and flows northeasterly and easterly into the State of Nebraska, and there, in conjunction with the North Platte, forms the main Platte river, flowing through the State of Nebraska and into the Missouri river. (Objection.)

All the streams that I have mentioned take their rise in the mountains of Colorado and pass out into other States or Territories. I think this is true in every instance of the steeams from which

2359 waters are taken for irrigation in the State of Colorado. I can state pretty approximately the amount invested in canals for irrigation within the State of Colorado. I think it is between

sixty and seventy-five millions of dollars. That includes, of course, the main canals and the entire distributing canal systems of the State in full. I would estimate the improvements on the lands reclaimed by the canals of Colorado to be worth about one hundred million dollars. I think there are about two and a half million acres under the various canals in this State. I think those
2360 lands would average fifty to seventy-five dollars an acre, including orchards, of course. If Colorado should be deprived of the use of the water of its streams for the purposes of irrigation these lands I have mentioned would certainly eventually lapse into their original condition of sterility and barrenness and have no value beyond a grazing land value.

I think there is a larger acreage than that under systems or available to systems already built. I really have not investi-
2361 gated this recently, but I should say there are more than two million acres actually under cultivation; the balance would be used for meadows and for grazing, being irrigated; but actually under plow, about two millions or rather more than two millions of acres.

2362 I have had experience in farming in Colorado with irrigation. Briefly stated, it is as follows:

I commenced agricultural operations in the spring of 1884 in the Grand valley, and also horticultural operations. I there laid out the town of Fruita and shipped the first carload of fruit trees over the range. Fruita is under the Grand Valley system. I farmed various other tracts of land of our company there. In the same year I began agricultural operations in the San Luis valley, where I opened up what we called the North farm, under the Del Norte canal, seven thousand acres, about six miles north of Monte Vista, a town of our company. Then in the San Luis valley I opened up the South farm, under the Citizens' canal, of three thousand acres. I was interested in a ranch of about eight hundred acres that year in Morgan county, near Fort Morgan, also in some agricultural operations under the North Poudre Valley system, north of Fort Collins. The next year we farmed in the San Luis valley under the Empire canal. In the next two or three years we put about sixty thousand acres under cultivation. Yes sir, in general my farming operations extend to the present time and are conducted under the irrigating systems. During the twenty years I have been in the State of Colorado, I have traveled over the State considerably, and have given very close attention to agri-
2363 cultural and horticultural interests in this State during all that time. In addition to my practical experience I have made a study of these questions to some extent. Yes, I have also made investigations abroad with reference to irrigation and in so doing have visited southern France, examined the irrigation systems more particularly in the section of Nice, also in northern Italy, on the plains of Lombardy, and in the vicinity of Milan, and also along the Riviera, below Genoa and Naples, where the operations were

comparatively small. That was in the year 1889. I also saw something of irrigation systems in Holland that year. In 1893 I was again in Holland and made some investigations of the con-
2364 ditions of agriculture and irrigation there. They were quite different from the conditions in Italy. I made those investigations in order that the work of a commission which had been appointed by Governor Cooper of Colorado the year before, according to an act of the legislature, of which I was a member, in revising and codifying the irrigation statutes of this State, might possibly be more intelligently done, and with those credentials and by virtue of that fact Governor Cooper had given me special consideration and special facilities to examine the systems of agriculture and the conditions of irrigation as practiced there. Yes, I have read extensively the writings of others and of their experiences upon this subject. As to my conclusions with reference to the productiveness of irrigated lands as compared with non-irrigated lands, and with
2365 reference to the capacity of these lands to support population, they are, as a general proposition, that under average conditions in the State of Colorado, for instance, where irrigation is employed, on the one hand, as compared with the average conditions in the section of Kansas of which I have spoken and where I resided and farmed, in what is termed western Kansas, it is my judgment that a family of five persons during a decade can more safely rely upon the production of ten acres of irrigated land in Colorado for a livelihood than upon one hundred and sixty acres of non-irrigated land in that section of Kansas; that is, particularly the Smoky Hill and the water sheds of the Smoky Hill, Solomon and Saline, and all along the Arkansas river in that State where irrigation is not in vogue. I can say as to the possible diversity of agricultural and horticultural production under average conditions with irrigation in the State of Colorado, as compared with the average conditions in the valleys in Kansas, of which I have spoken, and where I lived, it is
2366 almost infinitely greater. That conclusion is based upon my own experience in both States. In 1871 I planted thirty acres of orchard and miscellaneous crops north of Abilene, where I lived, adjoining the town. I re-visited the orchard a few months ago, and where I had planted, I think one thousand apple trees, one thousand pear trees, five hundred peach trees, etc., there were less than a dozen pear trees living and less than a dozen apple trees. All the other trees had disappeared and I was informed that they had practically disappeared as many as ten or fifteen years ago. I never raised but one crop of peaches and but one crop of apples in ten years, from the time I planted the orchards, for climatic reasons—frosts as well as an insufficient moisture to mature the fruit in July and August. I tried various experiments in vegetables in the same way, and it was not a commercial success—not possible. I tried various other crops and made various experiments. I spent a good deal of money in trying to devise a system of wider diversity of agri-

cultural and horticultural production there, but at the time I left Kansas I had concluded that it was not possible to get much
2367 beyond a fair average crop at most three years out of five there. But winter wheat was more successful. The tame grasses in Kansas were also practically a failure, which limited the range of agricultural production in that part of Kansas to two or three of those grain crops. I found this year large areas in the vicinity of Abilene still unimproved, in its wild nature, but grazed and devoted to dairying. On lands in the State of Colorado under irrigation in such valleys as the Arkansas or Grand, the range of fruits adapted to our latitude and altitude and normal conditions of temperature are as great as in any country I have ever seen. So also of vegetables, grains and grasses.

Recently I visited the Arkansas valley and the Fort Lyon canal and an addition to the town of La Junta and in looking over land I was interested in fifteen or seventeen years ago, now cut up into small tracts, and which I thought would practically never be
2368 reclaimed, I find they are now planted to sugar beets, and as to this same land, I was positively assured by those having charge of it that they were making a better and safer living for themselves and families on two acres of that ground than they were able to make in a term of years on one hundred and sixty acres in
2369 the State of Kansas, and I know of cases where practically the same results can be shown upon four or five acres where there is some fruit grown. In the State of Colorado not only the crops that are grown in Kansas, but for instance, alfalfa, can be grown far more successfully here where the moisture is greater, than in that part of Kansas. It is practically impossible on the great upland ranges to secure results commercially profitable in Kansas that are at all proportionate to the results we can obtain here by the aid of irrigation. Yes, I can give some instances of the value of crops per acre in Colorado. I saw an orchard at Palisades, in the
2370 Grand valley, last year, from which was taken a gross product of more than one thousand dollars an acre in peaches.

Yes, I can speak more particularly with reference to the Arkansas valley. I have seen acres in the vicinity of Rocky Ford where the total gross production for a single year has been more than six hundred dollars per acre, the production in many instances ranging from two hundred dollars an acre up to six hundred dollars. I think there is a district there equivalent to thirty square miles where the average production this year will amount to more than a hundred dollars an acre. It is the tendency inevitably of irrigation to distribute the lands among a larger number of people, because it takes a larger amount of capital for the ordinary farmer per acre to start agricultural operations in the irrigated country, and therefore necessarily confines him to a smaller acreage; and again, after he has acquired experience and proper skill he finds it to be more profitabl- to confine himself to such a class of products as requires skill, intelligence and a higher price for the products, and this results in

what is called intensive farming, such as is practiced in the irrigated countries abroad, where I have seen people gaining a
2371 livelihood on an average of less than half an acre per capita.

In response to your question in reference to this being an advance in the methods of farming upon those heretofore in vogue in this country, I will say that the difference between the progress which is exhibited where this sort of intensive agriculture is practiced and agriculture under average conditions in the Mississippi valley, as also in western Kansas, where I lived, is as great as it is between the system of farming in northern Illinois today and
2373 that on the cattle ranches in Texas.

Yes, on reflection I find that I embodied an error in my testimony. The valuation that I placed on the outlay for farms, etc., included an outlay of ten to twenty million dollars made for the laterals and lateral works belonging to these farms, and I also included that amount in the cost of the canals, so that my estimate should be reduced either as to the total outlay for canals in the State or the valuation of the farms, ten to twenty millions, as I embodied that valuation in both estimates.

In reference to what disposition was made of those ditches with which I was connected, and more particularly with reference to contracts for the use of water and the ultimate transfer of the ownership of the ditches, in every instance adopted the plan of eventually transferring the ownership of the ditches and therefore, of course, the administration of the canals in question to the beneficiaries, by embodying in the contracts for the purchase of
2374 water a clause to the effect that when all but a certain percentage of the estimated capacity of the canal was sold to owners of the underlying lands, the title to the irrigation works should be transferred to a corporation composed of such land owners, and that has been done in every instance with the corporations referred to, with one or two exceptions, the time not having arrived when such transfer can be made. Yes, the contracts provided for the ultimate transfer of the control of the ditches to the farmers under them.

In reference to the general water level of the country within that part of Kansas within which I have operated and the connection between the water level and the streams, and as to how the water level receives its supply, my observation and experience in the valleys of the Smoky Hill river and its tributaries, such as the Solomon and Saline, is that the water level is higher and higher as you recede from the river and approach the base of the uplands,
2375 and that is true of the Arkansas river in Kansas, according to my information and my observation, so far as I have made any. This ground water receives its supply from the percolation of the rain waters of the great plains bordering the valleys.

In reference to the increased acreage in cultivation in certain counties in Kansas for the last twenty or twenty-five years, there has been a larger percentage of such development, of course, in the eastern and central western sections than in the extreme western

section of Kansas, and the effect of the increased area under cultivation upon the absorption of water is to increase the absorption of the rain fall. There is less run-off. Yes, I have made an investigation or study of that question to determine the percentage of the increase. My estimate for the section of Kansas in which I lived, viz: the Smoky Hill River valley and the uplands bordering the valley of that river, is that there is about twenty-five per cent. increase in the absorption of rainfall.

2376 Such rainfall has practically no effect upon the water level adjacent thereto, except a mere strip bordering the side of the bed of the stream. If the water in the river would rise it would raise the water level immediately bordering the river, through percolation from the stream itself. In reference to the water bordering the river acting as a dam to prevent the run-off and raise the water level near the banks of the river, I would say that that would be true, because the percolation from the bordering uplands is toward the river bed, which is the lowest point, and if that is impeded by the rise in the height of the volume of the water in the river, it acts for the time being practically as a dam and checks up that flow and raises the water level back from the river where it is not affected by the water percolating from the river itself. Of course that recedes as the river goes down and the normal plane of the water

2377 level is re-established. In reference to the percolating waters in the soil, and my attention being more particularly called to sand dams that have been used in diverting water into the ditches, in my experience we find it necessary very frequently in the low stages of water in the rivers of Colorado where we are diverting water for irrigation, to throw sand dams across the bed of the river to shut off the sub-channels and divert all of the water or practically all of the water into the head works or intakes of the canals. This is generally done by scraping up the sand in the river bed to a height varying from three to six or seven feet, so that it will hold back a head of water of from two to in some instances six feet. Such sand dams are usually about six or eight at the base, with a height of from three to six feet, and the crest not more than a couple of feet in width, and

2378 it answers the purpose of keeping the water back. As to how long it takes the water to percolate through and show on the lower side of such a sand dam, I will say that those dams are temporary and are only expected to be employed for a few weeks, but I recall no instance where the pressure has been sufficient to force the water through by percolation, and in that way destroy the dams. There is practi-ally no appreciable percolation—no sustained flow certainly—otherwise the dam would dissolve.

In reference to my observations as to the effect of irrigation upon large areas regarding seepage waters or what are sometimes spoken of as return waters, my observations in the lower Platte valley are that the presence of such return flow is very evident. I think the

statistics show that more than a thousand feet of such increase in the return flow already appears in that valley, so that repeat-
2379 edly the entire volume of water may be diverted at a given point into a canal and a short distance below there will be a sufficient head of return water—seepage water—to justify irrigating operations under another system and by another diversion. I have seen that carried on to the extent of six or eight diversions. In the Arkansas valley the amount of return flow is not so great as upon the Platte, because irrigation has not been practiced in the Arkansas valley so long nor does it cover such a wide range of territory bordering the valley; but the return flow in the Arkansas valley is very noticeable already. Within the past two months I visited the head-gate of the Fort Lyon canal. All the water was being diverted into the canal. Three miles below the head-gate of the canal, at the river bridge near La Junta, there was such an amount of water—such an amount of return flow—that I supposed before I drove up to the head-gate that they must be wasting water, but they were not. There were perhaps twenty or thirty cubic feet of water in that interval flowing in the river. The effect of the return flow is shown under the Fort Lyon canal, for instance, in the Arkansas valley, in those dry gulches that were formerly never supplied with
2380 water except in flood times from cloudbursts and excessive rains, which are now permanent streams below the point where they are crossed by the canal, and in at least half a dozen cases canals now are taken out of those gulches and supply adjacent lands, the water being obtained, of course, from the return flow and seepage. Yes, I can name streams or creeks or arroyos where the return water is shown in the manner I have described. It is shown in the Gageby creek, which is northeast of the town of Las Animas. It is shown by the increased volume of water flowing in Horse creek and Adobe creek under the canal system, and also in a creek almost north of Las Animas where a ditch is taken out and irrigation from it practiced; also in Graveyard creek, north of Fort Lyon, at Limestone creek, in that section of the valley, and in two other creeks whose names I do not know, and in at least four or five instances canals have been taken out or irrigation practiced from the
2381 water supplied by such return flow and seepage. And this seepage or return water has had the effect upon the Arkansas river in eastern Colorado and western Kansas of making a more permanent stream of it; and the return or seepage waters upon the South Platte river near the line between the State of Colorado and the State of Nebraska have also resulted in an increased flow of that river.

In reference to the failure of general farming in western Kansas of which I spoke yesterday, I meant that portion of Kansas west of a line drawn north and south through the State at Dodge City, though of course as the rainfall diminishes as you proceed toward the Colorado line there would be possibly in some years a degree of success in agricultural operations bordering that line that would

not be true fifty or seventy-five miles farther toward the Colorado line. I am speaking of the general average as to the results. If it be true that the crop yield in Kansas, particularly the yield of
2382 corn about Wichita and Abilene, has decreased, I attribute it to the diminished *virgin* fertility of the soil, and perhaps that embraces the entire cause, apart from the failures that result from inadequate moisture in some years. The effect of the continual raising of the same crop upon the same land year after year will be the diminishing of the productiveness of the land, unless fertilization is practiced on the soil. That is sometimes overcome by more skillful and intelligent farming. That involves the rotation of crops. Yes, the conditions in respect to more skillful farming in western Kansas have improved with a wider adaptation of the system of agricultural to natural conditions, and the failure to rotate crops has been a matter of discussion among the people of Kansas, and the same matter has come before the board of agriculture of the State of Kansas, in a report of the secretary of that board. Mr. F. B. Coburn is the name of the secretary who
2383 made such report, and it has also been urged by writers of special reports published in his general report. For instance, Mr. H. R. Hilton, a well known Kansas expert. The particular report I have in mind is that of 1898. It was also brought up in 1897 before that board. There is a copy of that report in this city (Denver) in the files of the "Republican" but it is not accessable to me at this moment.

2384 My particular observations of the Arkansas river began in 1888 at the time I began irrigation enterprises in the Arkansas valley in the State of Colorado. I am confident that there has been an increased flow during the winter months, and of course because of the return flow in the amount of water carried by that river across the borders into Kansas. From the years 1883 to 1888 I saw the Arkansas river in the State of Kansas only occasionally at various periods during the year. From 1888 until the present time I saw the river in Kansas twice, perhaps, every year, extend-
2385 ing through nearly all the months of the year. My observations of the Arkansas river in Kansas during that time were practically in the western section, from Dodge City west, very frequently as far east as Burrton and Hutchinson. The Arkansas river from the State line to Wichita, in a general way, differs from eastern rivers in this, that in that section as well as in eastern Colorado it is an intermittent stream—a broken stream—not having a continuous flow, the volume of water being much greater generally near the sources of the stream than far away from the sources, two or three hundred miles distant, contrary to the case of streams in the humid sections of the country. In reference to the June rise
2386 in the Arkansas valley which has been spoken of, and more particularly with reference to the time of it, and as to whether or not it is too early or too late for the starting of crops in Kansas, I will say that in order to practice successful agriculture by irriga-

tion in the Arkansas valley in western Kansas it is necessary ordinarily that moisture, either artificial or natural, by rainfall, be applied to the crops in the spring, because if the crops are not properly started no June volume of water will be of any practical value. I am very sure that there has been such an increased flow, during the winter and early spring months in the Arkansas river in western Kansas that greatly enlarge agricultural operations are now possible over what it would be but for that increased return flow, so that the crops may be irrigated and started in the spring and avail themselves of the flood waters that usually follow in May and June.

In reference to the revival of the use of ditches of late years in western Kansas, my information is that not only have irrigation projects been revived that for a long period have been practically useless, but there are new enterprises being constantly projected there and the agricultural operations in that valley in western Kansas are constantly being increased. In my judg-
2387 ment, that increase is accounted for by the more satisfactory supply of early water; that is, winter water and early spring water, as I have stated, and the introduction of more skilled farming and intensive agricultural, and particularly the introduction of alfalfa there. As to the effect of these return waters on account of irrigation in Colorado upon irrigation projects in Kansas, it has had the result of providing against seepage and evaporation in the bed of the stream, and consequently, those factors being modified if not greatly overcome. it enables a larger percentage of such flow as results from the melting snow and winter storms in the foot hills and on the plains of eastern Colorado to be carried down into western Kansas, which otherwise would be lost, under normal and natural conditions.

2388 In reference to the possibility of the maintenance of a sustained flow of water in the Arkansas river by means of storing the flood waters of the river, I will say that if the purpose were to augment the normal flow found in Kansas by building reservoirs in the State of Colorado to be drawn from under some uniform system to sustain that flow, that might possibly be done, but would not be undertaken by private enterprise. If such reservoirs are provided and a regular volume turned out from them for the particular purpose of creating an increased and sustained flow of the river in Kansas, something of that sort might be accomplished if there were a sufficient quantity of water to impound, and therefore overcome the loss of seepage that would exist under normal conditions. Taking into consideration the two hundred and fifty miles of sand to the east of the Colorado line, this matter of the storage of flood waters of the Arkansas river and turning the same into the stream would not be practicable, and certainly would not be justified as a commercial venture.

It is not an easy matter to draw a clear distinction between "high water" and "flood waters." I think it may answer the purpose to say that a flood is such a volume of water as would overflow the

banks of a stream or its tributaries; and "high water" is a volume of water above the average flow or normal flow, but such a volume as would not overflow the banks.

2389 In reference to the practicability of storing the flood waters in times of floods, like the recent flood in the Las Animas or Purgatoire river, I would say that that is practically impossibly physically, nor would any storage enterprise setting out to accomplish that be justified financially or commercially. There can never be but a small percentage of such floods impounded, and never will be in this State, because of physicial conditions and because of financial considerations, as I have stated. The physical conditions which prevent the storage of such flood waters within the State of Colorado are an inadequate number of suitable places for such storage to be made without such an outlay as would be entirely unwarranted, and the value of lands to be reclaimed by such waters so impounded

2390 are not and will not be for a long time sufficiently great to warrant such an undertaking financially. Yes, I make a distinction between the storage of high water and the storage of these flood waters. There will be a much larger percentage of the aggregate volume of water furnished to the Arkansas river by its tributaries as time goes on, particularly upon the smaller tributaries and where conditions may be found to be favorable for reservoir sites, etc., but as I said before, in the aggregate the percentage of the total volume of water in the Arkansas river and its tributaries in the State of Colorado that can be profitably impounded will be a very small one, and must always be a very small percentage. As to the facilities for the storage of water in the State of Kansas, the situation is somewhat different. In Colorado, for instance, most of the large impounding reservoir enterprises in the future will be located across the valleys of the tributaries and not out on the plains. The fall of the country—the grades—being too great to warrant the hope of any considerable area being so employed; but in the valley of the river in Kansas the grades of the river are low and the valley wide. The banks of the river are low and conditions favorable for carrying out intakes to reservoirs which may be built; so that eventually, and at present, if the intensive agriculture which could and should be adopted there were in vogue reservoirs could be built at com-

2391 partively little expense in the valley of the main river itself, and then these high waters and flood waters could be used for the irrigation of lands in Kansas. In my judgment that is the practicable thing to do. I make the statement that if the purpose were to impound say thirty-three per cent. of the flood and high waters of the Arkansas river in Kansas, it might be more inexpensively accomplished as conditions are there at this time than if a similar undertaking were to be made in the State of Colorado. In other words, that the cost of impounding such water in the State of Kansas, per acre foot, would be less than under average conditions across the border in Colorado.

2392 Q. In the distribution of water in this State it is customary to distribute it, you said, according to the priorities of the ditches. Is that always carried out in the practice of distributing water, and if not, why not?

A. Not always, fully. If, for instance, a person has a priority, No. 1, on the South Platte river, located one hundred miles below the point where a junior appropriator, No. 2, has taken out a canal, it is not the practice to attempt to carry a small volume of water past the junior appropriator in the vain attempt, perhaps, to reach the prior appropriator a hundred miles below, because it might result in failure to supply him and would of course be a loss to the junior appropriator. The fundamental idea of the appropriation and use of water is that the water should be used beneficially and economically, and that dominates to a certain degree the legal rights of appropriations as to the order of their appropriation and application of water.

Q. May not the water of the Arkansas river be stored in Colorado during the non-irrigating season and during high water and afterwards discharged into the river and thereby the average flow of the river in Kansas be sustained, though it be doubtful if even
2393 this would be sufficient in carrying the water across the dry stretch you have described as in Kansas?

A. Yes.

Cross-examination.

By Mr. CAMPBELL:

Assuming the average normal flow of the Arkansas river at the State line is in the neighborhood of six hundred cubic feet of water per second of time, reservoirs could be erected in Colorado to impound the flood waters that would result in sustaining this normal average flow. It would not be a practicable, feasible scheme for private enterprise at the present state of land values, nor at any stage, until at least that volume was impounded by works directly located in western Kansas. That is, I mean to say that the
2394 first thing to do would be to place the impounding works in the State of Kansas. If you were to impound that water in Colorado a few miles west of the State line it would be practicable and feasible, provided there are suitable sites. Were that impounding in Colorado to take place three hundred miles west of the State line, it would not be feasible nor commercially profitable, but still such impounding even at that distance as conditions now are—I mean there being a sustained and perpetual flow of water in the river as the result of irrigation—a certain percentage of such impounded water could be carried, even though two or three hundred miles, into the State of Kansas. I think it is a practicable
2395 scheme to erect reservoirs above the Colorado line to catch the flood and other waters that would keep up the normal

average flow at the State line to six hundred feet and still give the ditches in Colorado the water they are entitled to.

I have made some study of the act of Congress known as the "Reclamation act." I believe it is physically practicable to get the water that I have spoken of in the reservoirs in Colorado.

2396 But it would cost entirely too much to warrant the undertaking. I should say that it would cost to impound say fifty per cent. of the flood waters of the Arkansas river and its tributaries from twenty-five to seventy-five dollars per acre foot—a cost not at all warranted under the present condition of agricultural values. I have no idea of how much it would cost in dollars and cents.

2397 It would cost tens and tens and tens of millions of dollars. Six hundred cubic feet of water per second of time would irrigate something a little more than thirty thousand acres. This estimate is based upon the unit of water right that we adopt in our contracts for the waters users and land owners in the Arkansas valley in this State, which is 1.44 cubic feet of water per second of time for eighty acres. In making this estimate I do not take into consideration the seepage or return waters. It is just the direct application. Taking into consideration the amount of seepage and return waters, I believe that ultimately a flow of six hundred cubic feet of water per second entering the State of Kansas in the Arkansas valley—I say ultimately because ultimately skillful and intelligent agriculture will be adopted there by which the rainfall and the seepage waters and the waters impounded as well as the waters delivered directly from the river will all be more skillfully and economically used—will be the reclamation of many and many hundreds of thousands of acres. I believe it is possible with the rainfall moisture and the flood waters, embracing the percolating

2398 underflow waters which are pumped, etc., to develop a system of intensive agriculture embracing the entire valley of the Arkansas river in the State of Kansas. I should say that eventually the return flow would be equivalent there at the State line to fifty per cent., so that there would be available some where from seven hundred to a thousand cubic feet of water per second of time. The service of that amount of water might be extended there to cover the reclamation of one hundred and sixty acres of land for each cubic foot of water. Multiply one thousand by one hundred and sixty and it will determine the total acreage. Such land

2399 when irrigated would be worth from seventy-five to a hundred dollars an acre. The erection of reservoirs in Colorado would certainly augment the supply of water in canals.

2400 Cross-examination.

By Mr. ASHBAUGH:

I don't think that the conditions of the Arkansas river either in the State of Colorado or in the State of Kansas are the best that can be had. The river can be artificially made better and more profit-

able for the people of the State of Colorado and the State of Kansas. I think it would be wise and profitable to direct our energies to that end. I left the State of Kansas in 1883 and came to Colorado, and since I have removed to Colorado I have given a large share
2401 of my time to irrigation projects, directly and indirectly. Since 1883 I have taken the irrigation side of the development of the country.

The relative conditions in Dickinson county and in Saline and Ottawa counties, which adjoin Dickinson, are about the same.
2402 The answers that I gave in my examination yesterday as to Dickinson county would be practicably and within all rea-
2403 sonable limits true as to Saline and Ottawa counties. In the year 1881 there was more corn. I am not quite so clear, but
2405 quite likely thirty or possibly forty bushels. I am very positive there was really no average yield of thirty-five bushels of corn in Saline county in 1879. If the figures introduced in evidence yesterday by the defendant Colorado show that the average yield of corn in Saline county in 1879 was thirty-five bushels, I think those figures are too great. I think all the published reports as to crops during those years are too great. I think the average yield of corn in Saline county in 1880 was ten bushels.
2406 Then if the figures that were introduced show that the average yield was twenty bushels, I think those figures are too great. In the year 1881 I stated in my direct examination that the average yield was about thirty-five bushels. If the figures introduced show that the average yield of corn in the year 1881 was thirteen bushels, then I probably got those years reversed. I should say frankly perhaps I should have studied up. Perhaps I have not looked at a figure nor thought of it before for many years. It is quite likely that the year I have in mind as to the results of which I have stated in 1880 may have been in 1881. I may be not quite correct as to those dates. I know fluctuations occurred, but I am not quite certain as to the dates. I suppose 1881 was better than 1880 for corn. Then if the figures introduced from the agricultural reports show that the average yield of corn in 1880 was twice as great as it was in 1881, I have reversed it and am mistaken. Then the year I have in mind as furnishing a poor yield should be 1881 instead of 1880. My recollection is that twenty bushels of wheat in 1881 was a fair average. If the figures introduced here in evidence show that the average yield was thirteen bushels to the acre, then I have gotten the years reversed, as before, in regard to corn. My recollection is that the years 1881 and 1882 were about alike as to the average yield of wheat to the acre. Then if the figures that were introduced show that the year 1882 had twice as great an average as the year 1881, some mistake occurs. I have used
2407 the year 1880 for 1881. I have given my experience with my own crops. Of course it has been many years, and I may, without having looked it up, be mistaken. I was not farming

wheat so extensively then as a number of years before, and
2408 the data is not quite so clearly impressed upon my recollection. If the figures show that either in 1881 or 1882 the crop was twice as good as in the other years, then I am mistaken, and quite likely, because the figures—while I say they are too great, that has always been the case there in the published reports, still the trend would be more likely to be correct than my unsupported statement based upon my present recollection. I don't think that the figures as published in those agricultural reports come from as reliable sources as my own observation. I should prefer to rely upon my experience with my own land. My recollection that the wheat yields in 1881 and 1882 were about alike might not be more correct than the figures that show that one of these years was twice as good as the other, as to those two particular years, because I was not so deeply interested in the results as I was in the previous years, and my recollection is not quite so clear and reliable.
2409 I think there was a year in there in 1880, 1881 or 1882 where the yield was nearly twice as great as in those other years in the early '80's, but I am unable here to select accurately the years I had in mind. As to the source of information they had in these reports, the attempt was made to procure data and statistics through the agency of the assessors. I am not quite sure whether there was a law in Kansas at that time requiring the assessors to make any returns. That law may have been passed, possibly, after I left the State. I should not place a very high estimate on the reliabi-
2410 lity of those reports for my own personal purposes. (Objection.) These reports are the evidence that has been introduced by the State of Colorado and not by the State of Kansas. (Objection.)

The source of the Smoky Hill is out upon the plains of western Kansas. Possibly the water shed extends over the borders of Colorado. I have not noticed lately. The source of the Solomon is about the same. I think possibly a little of the drainage area extends up into Nebraska. I should say that the Solomon river is longer than the Smoky Hill. Neither of them rise in the
2411 mountains. Neither of them get any direct flow from the melting snows in the mountains. I think they are not affected by the melting of the mountain snows at all.

I was located about a mile from the Smoky Hill river, in Dickinson county, Kansas. It was about 15 to 20 feet down to water where I was located. There was no underflow there that was perceptible so far as affecting crops was concerned. The corn that we raised was not moistened from beneath, and we depended upon rainfall. The character of the soil in the valley, that I cultivated, was what we call a sedimentary sand clay loam. It varied, and was considered at that time a very good soil. I had good reason, as I supposed at that time, to regard it as a good agricultural country.
2412 There have been a number of theories about a great many different subjects connected with the agriculture and climate

there, and some of those theories have been found not to be true, I think. We have theories as to the best methods in agriculture in Colorado, about the development of agricultural resources. It is possible that some mistakes may occur, and some have occurred. It is true generally that theories are finally tested after a sufficient number of years by the actual experiences of the men who have given attention to these subjects. I think it can be said that
2413 people went to Kansas as they went to Colorado, with a hopeful prospect, and they had theories about different means of development, some of which were true and some of which were not true, and the best test is the experience of the men who have lived there and operated and observed during all those years.
2414 The source of the Arkansas river is mainly in Colorado. A much larger proportion of the Arkansas water shed lying within the State of Colorado is below the mountains and out on the foot hills and plains of eastern Colorado. The majority of all the water that flows in the main stream, taking the twelve months of the year into consideration in the aggregate, would come from the foot hills and the plains and not from what would be called the mountain sections or districts of the water shed. Some of it comes from the mountains and the snows in the mountains. Practically, the amount that passes Cañon City all comes from the mountains. So that if the testimony has shown that there were seven hundred and fifty cubic feet per second of time passing Cañon City, that
2415 amount came from the mountains. This condition was not true at all of the Smoky Hill or the Solomon. The Republican river rises on the plains of western Kansas and Nebraska and northeastern Colorado, but does not get any of its rise at all in the mountains. It is like the Smoky Hill and the Solomon in that respect. In that respect it is different from the Arkansas river.

I am acquainted with Elwood Mead and his work on "Irrigation Institutions." Mr. Mead is an authority upon any topic that he treats of—the very highest authority. He is connected with the Government service. If in speaking of the Republican and Arkansas rivers on page 288 of his work on "Irrigation Institu-
2416 tions" Mr. Mead uses the language "The surface water of these streams is insignificant as compared with the greater volume which travels slowly underground," I think he is mistaken. (Objection.)

As to the proportion of water that is used for irrigation that is lost by evaporation and by being absorbed in plant life and vegetable life, taking into consideration a term of years so that pretty nearly the full effect or rather the fullest results from underflow might be obtained, in that case I should say that thirty to forty per cent. is so lost; the balance is returned. If on page 300 of the work on "Irrigation Institutions" Mr. Mead uses the sentence: "In
2417 irrigation an average of two-thirds of the water diverted is dissipated," I might say that might be true, in fact a greater loss in some instances, but where conditions are quite different from

those in the streams I have referred to, and therefore I think that his estimate is too great. As to whether his estimate is too large where on page 320 he says: "As water is now used, about two-thirds of it that is diverted by ditches and canals is taken up by growing crops or absorbed by the air through evaporation," that depends upon what particular section or district he has in mind. It is obviously not true of the higher elevations, and is not true of
2418 the North Platte and its tributaries in this State. I think that estimate is too large a percentage or claim for loss in the Arkansas valley even yet. The return flow in that valley will be very much increased, and is steadily increasing.

The soil in the irrigation districts of the Arkansas valley from the foot hills of the mountains down to the State line generally is rather a heavy percentage of clay as against sand, and of course all of it is sedimentary. The soil is more sandy and lighter, more porous, especially the sub-soil, as you approach Kansas, and that increases after you cross the Kansas line. Water would find its way through the soil in Kansas in the Arkansas valley more readily than through the soil in the Arkansas valley in Colorado.

If 750 cubic feet of water passes Cañon City in the Arkansas river and all of it passes into the Fort Lyon canal, as to how much of that 750 feet would find its way back into the stream below, I should say that in that territory under that canal, the return flow by this time would be equal to between twenty and twenty-five per cent.
2419 Then if the next ditch below where it got back into the river took the same amount, twenty or twenty-five per cent., which would be one or two hundred cubic feet of the original seven hundred feet, the next canal would do the same thing and take the whole of the return water.

Q. If that has been repeated as many as four times, tell me how much of the original seven hundred feet would be in the river?

A. Well, there wouldn't be very much, beginning at the headgate of the Fort Lyon canal, to leave any results for Kansas, but most of the seepage water under that system is returned to the river well towards the borner of the State of Kansas and could not be so used four times over. In regard to my statement that irrigation in Colorado tended to make the stream more permanent, I will say that it furnishes more water for general use; that is, for irri-
2420 gation. But when it is not used for irrigation there is more water in the stream than if there had been no diversion whatever.

Winter irrigation is becoming quite popular now, and there is more water for that period and for what we call the non-irrigating seasons. No, it is not true that there are certain crops that we have found by actual experience ought to be irrigated in the late fall and winter season in Colorado. There is practically but little winter irrigation employed in the Arkansas valley or elsewhere in Colorado. Late irrigation is not of any greater benefit than at any other time of the year.

Q. Are there not certain products that you have found it to be advantageous to irrigate at other times of the year?

A. No, sir.

If on page 170 Mr. Mead, in his work on "Irrigation Institutions" says: "Irrigation of orchards requires as much water in November as in May," I think he is entirely mistaken as regards Colorado. If in the next sentence he says: "Alfalfa, potatoes and small fruits all require late irrigation," I think that correct, but that
2421 depends on what district you are talking about. That statement does not apply at all to the conditions in the Arkansas valley. Let me explain: We use the term there of water for late irrigation in contradistinction to the use of water in May and June for the months of July and August. We call that late irrigation now. It is not late in the year; it is late compared with the use of water under the system of agriculture that used to prevail. Small fruits, for instance, are matured later than the month of June. An additional crop of alfalfa may be gained sometimes by irrigation in August, but never any later, and potatoes are matured, of course, many weeks earlier than that in the Arkansas valley. It would be very harmful indeed to irrigate orchards in the Arkansas valley in November. On the contrary, I visited an orchard within the past four weeks and it was injured by irrigating in September, as early as that, because the wood doesn't ripen and the buds are not
2422 as hardy, and their experience has been such that water after the middle of September should not be employed in that valley in Colorado to irrigate orchards. Any water would be too much at that late season of the year. Of course a very inadequate or rather a very slight irrigation might not do any harm, but it is not commended as advisable.

I have no doubt about it that the Arkansas river has been made more permanent by the system of irrigation in Colorado.

Examining Complainant's Exhibit A–45, showing the condition of the Arkansas river at Cañon City, taken last May, and if the testimony shows that not a drop of water had passed Garden City in the river from August, 1903 to May 1904, I will state that they had probably taken the water out farther up the river in the State of Kansas. I don't know anything about that. It may be cor-
2423 rect that they had not.

Q. The river, then, where it passes Garden City, at least, does not appear to have been made more permanent, does it?

A. As compared with periods in the past? I don't know. I don't believe that it is the first time at that season of the year when the river was dry at that point. I don't know that it was true that the river was dry from August until the succeeding May, last year. I have never seen it dry for that length of time. I have never observed it closely and continuously for that period of time. The volume of water, if there had been sufficient anywhere in the stream to reach that point without having been diverted, was diverted, of course, and that prevented the flow of water there.

2424 As to the effect on the stream and the valley below if a general system of reservoirs were constructed in Kansas and Colorado to impound the flood waters of the Arkansas river, of course the effect would be to diminish the volume flowing in the river below the place of such impounding. I have seen the Twin Lakes reservoir. It is located about two miles above the town
2425 of Granite, Colorado, and about twenty miles below Leadville. This must be one hundred or one hundred and twenty-five miles above the point where it is used for irrigation. By such storage the flow of the river between where the water enters the river and where it is taken out has been increased. It has been
2426 reduced to a practical certainty as to how much less they may safely take out of the river than is put in. In this case of the Twin Lakes reservoir they take out about eight to fifteen per cent. less than they put in. This would be no serious reduction, and it can be reasonably estimated. A system of reservoirs does not necessarily require the reservoirs to be located immediately at the point of the head-gate of the canal where the water is to be used, if conditions are favorable; but if that reservoir were located say at La Junta or any other point down the valley and a dam made to carry the water from it the same distance into Kansas there might be a question as to whether it would be any more successful, because the loss by seepage would be very much greater. The conditions are different, because almost all the way from the outlet of the Twin Lakes storage reservoir to the point where it is diverted into the Bob
2427 Creek canal the channel of the river is rockier, or at any rate this rock is very near to the surface and the bed of the stream is very narrow and therefore the effect is to minimize very greatly the amount of water that would otherwise be lost. I doubt very much if there is two per cent—one per cent—one-half of one per cent—lost of that water from the outlet to Cañon City where the channel of the Arkansas river is confined to a rocky bed. The fact that the river has a precipitous fall there would have some effect, because it would fall faster and be very much less time on the way, so that the amount of absorption and the amount of evaporation increases as you go down the valley; and this is true in the Arkansas valley.

The soil in Colorado is very close and compact as compared
2428 with the soil farther down the valley. We don't have much trouble in Colorado about water seeping through the banks of our canals. There may be places where it is so sandy that it would seep through, and that will depend upon the amount of sand and gravel in the land. The sand and gravel don't pack so closely. It gets sandier, I think, as you go down the river, as far as Garden City at least. Below Dodge City the condition in this respect does not change very much. There is a section in the vicinity of Hutchin-
2429 son where it is much more sandy than at Sterling, but it would have no effect, practically, upon the percolation of the water.

I don't know that I have observed the valley closely enough to make a statement of any value as to how far back from the banks

of the river that sandy condition exists. I recall sections as I have been through the valley that are sandy and probably the sub-stratification is sandy and porous almost clear across the valley. My real knowledge of conditions in Kansas was confined more to the Smoky Hill and the Saline and Solomon valleys, and I may fairly say that my knowledge of the Arkansas valley was a somewhat general or kind of superficial knowledge. When I stated in my direct examination that the irrigation interests around Garden City had been revived within the last few years, that statement was not based upon my personal observation.

2430 The first work that was done upon the Fort Lyon Canal system was in 1884 or 1885, in a small way. The Catlin canal had been built at that time. The Rocky Ford ditch in the same district had been built previously. The Las Animas or Jones ditch, supplying a large territory on the south side of the river tributary to the town of Las Animas, had been built prior to that. The Manville ditch below Lamar and one or two small canals in that neighborhood were also built. I don't know that I can state definitely when the first ditch was built around Garden City, but my recollection or impression is that it was in the very early '80's. There were ditches in existence at Garden City at the time I dug the Fort Lyon canal or began work upon it, but I cannot say how many were drawing water at that time, but my recollection is that there was quite a system of them at least, and I think that quite a system of them was in existence before those others that I

2431 spoke of. The Amity canal was built about 1885 or 1886. It was built at least after the Fort Lyon. And let me say in that connection that the date that I fixed as that of the beginning of the Fort Lyon canal construction applied only to a very small affair. I took hold of it in 1887 and developed it much more extensively, and then it has been since developed much more extensively. It is 117 miles long. Toward the end of it it averages about six miles back from the river, and in some instances it is eight or ten miles back.

2432 My observation of the flow of seepage water from the canals would lead me to conclude that the flow is not so rapid as a mile a year. The rate of flow depends very much upon the quality of the soil. If the soil is a very heavy clay, and, for instance, with adobe, the movement would be very much slower, in fact the loss from the canal from such seepage would be a minimum, and consequently the velocity would be much slower. But much of the return flow reaches the river as the result of spreading the water out over the land in farming and not from the canals; that is, the source of the supply of the seepage is mainly from the water resulting from the irrigation of the lands, and not from the mere

2433 channel of the canal carrying the water. The return flow resulting from spreading water over the surface of the area irrigated seeps through the land. If the return flow was on the surface of the soil to the river, we would call it waste water. As to the aver-

age velocity of the seepage through the soil from Pueblo to Rocky Ford, there is another factor that enters in in that section. Many of those canals are located where there is what we call shale, a condition that is different from the condition farther down in the clayey, heavier soil districts, so that it might be there in places possible for the seepage to move more rapidly through that sort of sub-stratification than farther below; but I should say in answer to your question that the seepage, on the average, would move to the river after the country was once saturated, perhaps at the rate of half a mile per
2434 year. After the soil had become saturated, I don't think that the velocity would be increased, but the volume of seepage would be increased. As to the amount that goes into evaporation and into the life of the product, I should say that under the ordinary irrigation in the Arkansas valley it would be from forty to fifty per cent. I think the balance of the water either is returned by return flow or held in the soil and in the sub-strata as saturation. I think that two-thirds of the water as dissipation is too great an estimate in the Arkansas valley, if you leave out of consideration the raising of the water level beneath the surface. By "dissipation" as used above I mean absolutely lost by evaporation and consumed by evaporation and agriculture. As I say, a very large percentage is held
2435 in the shape of saturation. I don't think the dissipation will gradually decrease. Of course the same system of crops one year as compared with a decade later will not affect the precipitation or loss of evaporation, nor will an alfalfa field consume and waste in that way any more water in the first instance than it will later, but there will be more and more water saved in the sub-soil and sub-stratification as time goes on, that is, the water level will be raised nearer the surface.

I am acquainted with the Rocky Ford highline canal. At the point of discharge it is fully eight miles back from the river. I should say that it was perhaps one hundred and fifty to one
2436 hundred and seventy-five feet at its terminus above the level of the river. The return water in that case does not pass from the canal directly through the soil back to the river; it wastes into Timpas creek, which is a tributary of the Arkansas river, and has a valley that is parallel to the general direction of the valley of the Arkansas river, and the return flow from the extreme lower section of that canal would reach that creek, and has reached it, as shown by the fact that it is a very prominent stream and ditches are taken out of now. This is almost always true where the canal is far back from the river. Where it crosses these transverse valleys and the return flow is carried to the river through those creeks or tributaries coursing at these particular points under the canal. It is true that some crops absorb a great deal more water than others, and it is true that in some years there is a greater evaporation than during other years. During a long dry season there would
2437 be more evaporation than during a cloudy, wet season. There would be a great deal more, not practically affecting propor-

tionately the loss from irrigation, because you irrigate a crop in ten days and you stop there, whereas if you are irrigating continuously all the season during a season of that character there will be a great deal more evaporation in the aggregate than otherwise.

2438 When I spoke of being dissatisfied with my agricultural experience in Kansas I did not mean that it was because of the quality of the soil, nor the climate, provided they could get sufficient water and moisture. On the contrary, I was then and am still a believer in the surprising natural fertility of that soil.

2439 I left Kansas because there was no other field that was open to me for the scope of operations I cared to conduct, but agriculture, and I thought large operations involved rather too much risk. Withdrawing water from Kansas would not be quite so great an injury to Kansas as withdrawing water from Colorado would be an injury to Colorado, because Kansas has much greater rainfall than we have generally in this State. Water is neces-

2440 sary to sustain life. It is just as important there as here, whether it be in rainfall or in dew or in irrigation.

I have had some experience in regard to hot winds in Kansas. I know that there are not as many hot winds in very recent years in western Kansas as there was perhaps during the decade that I spoke of, beginning with 1868, but there have been hot winds extending, as I saw four years ago, I think it was, away up into Nebraska—very disastrous. There were four years beginning in 1875, following the hot wind year of 1874, when there were no hot winds in Kansas, but they reappeared the following year and will appear again, in my judgment. After leaving Kansas I retained large in-

2441 terests and farmed extensively for a number of years after that in Kansas, but of course since that I have withdrawn from that State, so far as farming is concerned, and have given my attention to irrigation in Colorado, and I am more on that side of the proposition than the rainfall side, and I have been looking at it from an irrigation standpoint for the last number of years. As to whether the Smoky Hill and Solomon rivers are higher in the spring than the fall depends upon the season. It doesn't necessarily follow. I have seen the Smoky Hill go out of its banks in October, and I have seen it a mere rivulet in March and April. I have seen it go out of its banks in March and April—almost every month of the year. There was not anything that

2442 was known as a June rise in those rivers, not particularly speaking. I have been acquainted with what has been known as the June rise in the Arkansas valley. I don't think you can say that there was any corresponding rise in the Smoky Hill or Saline or Solomon rivers. I expected a larger volume of water ordinarily in June because it was the time of the year when we usually had most rain, but we hadn't that idea in the years I lived there, that there was necessarily a June rise. I don't think we used the term as applied to that river. My idea of

2443 a June rise originated in this State after I left Kansas. The Smoky Hill and the Solomon rose slowly from rainfall.

There is a percentage—a small proportion very likely—of the water of the Arkansas river that comes from the mountains that must be from the melting snows. I have not investigated closely enough to speak positively, but it would be a very small percentage. That is, the floods of the Arkansas, particularly in the section between Dodge City and Wichita, are created by rains through that section filling the tributaries and floodding that section of the Arkansas as the Smoky Hill would be flooded. I don't know that it is a fact that the Arkansas river used to rise in the spring and remain up for a number of days and often a number of weeks when there was
2444 no rain at all. I was not aware that it was claimed as a fact. I don't know where there are any running streams above Cow creek, that enters at Hutchinson, that flow the year round into the Arkansas river. I can't state positively. Probably there are no such flowing, permanent tributaries, any more than there is farther north on the water shed of the Smoky Hill. The rainfall through the Arkansas valley from Dodge City up is about the same as it is north, and from Garden City to the State line it is less than at Dodge City. I presume it is a fact that the rainfall from the State line down as far as Dodge City is so small as to not perceptibly affect the flow of the river except when they have such a violent rain storm as is known in common language as a cloud-burst.

Cross-examination.

By Mr. CAMPBELL:

2445 Personally, I only know of a reservoir site in the Arkansas valley in Kansas north of Great Bend, but the topographical situation generally for a long distance in the valley and bordering the valley is such as to invite comparatively inexpensive
2446 reservoir construction. All along, something like the style of structure might be employed there as is employed in parts of India, as in the province of Madras, where about twenty per cent. of the surface area of the province is covered by reservoirs. It would be possible to develop in the Arkansas valley, where topographical conditions are similar, a very extensive system of
2447 storage. Reservoir sites of this character are innumerable between Great Bend and the Colorado State line.

Redirect examination.

By Mr. HAYT:

2448 In reference to storing these flood waters in Kansas rather than in Colorado, take for instance the Las Animas river, the descent or grade of the river is very heavy in Colorado and the stream is confined for perhaps a hundred miles to a narrow gorge, so that even if dams were thrown across it the area utilized for impounding the water would be small in comparison with the expense

involved, whereas in Kansas the water can be diverted from
2449 the main stream more easily. The banks are low. There is no rock to contend with and the canal construction is inexpensive.

2450 The Las Animas river in Colorado just referred to is sometimes called the "Purgatoire," also the "Purgatory" and the "Picket Wire."

I regard it as feasible and practicable to impound the flood waters of the Arkansas river in Kansas so that the same may be used for irrigation in that State. This can be done at reasonable cost for the amount of water that may be impounded.

In speaking of late irrigation, I wish to be understood that it is a relative term, depending upon the kind of crops to be irri-
2451 gated. A late irrigation of alfalfa in the Arkansas valley would be irrigation in August and possibly early in September.

2452 In reference to the percentage of water which is deducted for loss between the Twin Lakes reservoir and the point at which the water is diverted from the river by the Bob Creek canal, I will say that I have made no investigation of the matter. The percentage controlling may have been based upon mere conjecture, so far as I know.

In stating upon cross examination that if a reasonable amount of water were taken for reservoirs in times of floods or high water it would have the effect of diminishing the supply of water in
2453 the river, I had in mind the immediate effect. If the waters were used for irrigation as they are ordinarily used, this would still reduce the extreme volume of the flood, for instance, but the practical effect upon the stream below if the water was impounded and distributed for irrigation would be to improve conditions, improve the steadiness of the volume and be a benefit, as I view it, ultimately.

As I have already stated, I began to plan to remove from the State of Kansas about the year 1881 or 1882, and from 1881 on I was not giving as much attention to the growing of crops in Kansas as I had given theretofore, and the estimate which I have given counsel as to the yield is based upon my own recollection of the results of my farming and upon my recollection of the conditions in the
2454 surrounding country. In addition to farming I was engaged in banking and loaning money on farm mortgages, and I was for this reason very closely interested in the general conditions. I can only give the yield in corn and wheat in bushels during the periods I have mentioned approximately. This is especially true for the period of 1880 and since.

2456 D. C. BEAMAN, Denver, Colorado.

Direct examination by Mr. DAWSON:

My name is D. C. Beaman. I live in Denver, Colorado. Am 65 years of age. I have lived in Denver about 17 years.

I am acquainted with the Colorado Fuel and Iron Company. It is an industrial company, engaged in the mining of coal and the manufacture of coke and steel and iron products. I have been secretary of the company ever since it was organized, except perhaps one year. The present company was organized in 1892.

2457 There are now no general officers other than myself with the company who have general knowledge of the company's history. Some of those who organized and built up the company have died in recent years and other officers have been changed. There are a number of auxiliary companies connected with and operated in conjunction with the Colorado Fuel and Iron Company. They are the Rocky Mountain Coal and Iron Company, the Colorado Industrial Company, the Minnequa Town Company; the Minnequa Land and Water Company; the Mountain Telegraph Company; the Crystal River Railroad Company, and the Colorado and Wyoming Railway Company. That perhaps is not quite all, but they are the most important ones.

2458 The present consolidated company—the Colorado Fuel and Iron Company—began business in 1892; the auxiliary companies are all later than that, some of them are not more than a year old, and some 6 or 8 years old. They have been organized from time to time as the increased business operations and development of the principal company required. The total capitalization of the Colorado Fuel and Iron Company is $46,200,000. The paid-up capital stock is something over $26,000,000.

In round numbers the present investment of the Colorado Fuel and Iron Company and its auxiliary companies in the drainage area of the Arkansas river in Colorado is about $30,000,000. This investment comprises 18 coal mines, some 2500 coke ovens, 2 limestone quarries and the Minnequa steel plant at Pueblo, and part of the Colorado and Wyoming railway.

2459 The steel plant investment, I suppose, is in the neighborhood of $12,000,000 or $15,000,000. I know of none west of the Mississippi river that are nearly as large. There are 28 steel and iron mills, and when running at full capacity the finished product is about 550,000 tons per annum. The coal mines at

2460 full capacity produce about 3,500,000 tons of coal. The coke ovens 75,000 tons and the lime quarries 400,000 tons.

The daily capacity of the steel works, which consist of 6 blast furnaces of about 2000 tons, converter 2000 tons, blooming mill 1500, rail mill 1500, merchants iron mill 200, hoop and cotton tie mill 100, spike factory 100, bolt factory 16, casting foundry 80, pipe

foundry 60, 6 open hearth furnaces 650, 40 inch reversing mill 1100, rod mill 800, wire mill 650, nail mill 400, sheet mill 100, black plate mill 100, tin plate mill 200; making a total of something over 11,000 tons daily.

That would not seem consistent with my statement of the total finished product per annum, but in these various mills the tonnage is duplicated. For instance, the product of the 6 blast furnaces is pig iron, and that with scrap iron and other material purchased ontside goes through these other mills and appears in their finished product, which accounts for any apparent inconsistency in the figures.

2461 As to the values of these products, I could not separate them very well, but its aggregate is approximately shown by the gross earnings for the year ending June 30, 1903, which were $16,653,000.

The earnings for the present year have been very much curtailed by the strikes in the coal and metalliferous mines, which have been prevailing now for nearly 12 months.

2462 The number of employés when running full is about 16,000. As to the number of people dependent upon the operations of the company, I have figured it on the basis of what I call dependents on the operations, which is a little broader than the mere families of the employés. For instance, take what we call a coal mining camp. Everybody who lives there is dependent upon the operations of the mine, because if the mine is shut down the camp will be abandoned, so that the merchants, grocers, teamsters, and in fact everybody there is dependent upon the operations of the company. On that basis I figure that there would be 5 dependents to one employé, which would make about 80,000 persons in addition to the employés, or a total of 96,000 persons dependent upon the operations.

The pay-rolls run about 600,000 a month, and will aggregate in a year something over $9,000,000.

The operating expenses are about $6,000,000 more, making a total disbursement of about $15,000,000., but that does not include material bought elsewhere, but simply the expenses incurred in the operations. This money is most of it paid out within the limits of this State.

2463 In the operations of the company it is necessary to use large quantities of water. This comes from the Arkansas river, and its tributaries in Colorado, and from surface water flowing into the reservoirs. There are about 9,000,000 gallons of water used in each 24 hours, of which amount there is about 75 % returned to the stream under present conditions. This water is used for steam at the coal mines, for cooling the coke at the coke ovens, for domestic purposes for the people employed there, as well as for those employed at the steel works. It is also used at the steel works

2464 for cooling and condensing. The cooling and condensing water is used until it becomes too warm, and then it is re-

turned to the river. This amount of water is absolutely necessary for the operation of the company's business.

The company has acquired farming lands along the river, riparian lands with their accompanying water rights, and the water has been turned into the reservoirs of the company, and the lands to which the water was first appropriated lie idle.

Sometimes we change the point of diversion, but not generally.

In other places, for instance, the San Carlos river, we simply
2465 continued the ditches into the steel works reservoirs, and did not change the point of intake at all.

We have bought about 8,500 acres of irrigable land on the Arkansas and the San Carlos and Purgatory rivers, at a cost of about $335,000., and have changed the use of the water in those instances from irrigation purposes along riparian lands to that for manufacturing purposes principally. We are not now using all the water we are entitled to under our purchases, but the business of the company is *is* enlarging as the years go on.

We provide a great number of houses for our employés, and the investment for tenement houses in something over $800,000.

2466 At Pueblo where we have a large number of employés a great many of them get water for domestic purposes from the city.

The Colorado and Wyoming railway for the last year earned $383,000., while its operating expenses were something over $300,000.

The water rights which we purchased, nearly all of them, ante-
date 1865, some of them run as far back as 1861, as we have
2467 always endeavored to buy the oldest ones we could find.

The total amount of water thus acquired, or rather the right to the use of the water, is approximately 90 cubic feet per second of time, amounting to about 58,000,000 gallons every 24 hours.

Besides ditches we have constructed 4 reservoirs, and have a fifth one under construction. Three of these reservoirs are in Pueblo county and near the steel works. They have respectively the following storage capacity: Nos. 1 and 2, 500,000,000 gallons each. No. 3, 2,700,000,000 gallons. Another is on the Purgatory river but is not yet completed. It has an estimated capacity of 650,000,000 gallons. The other one is what is known as the Sugar Loaf reservoir in Lake county, Colorado, near Leadville. This has a
2468 capacity of 5,600,000,000 gallons.

These completed reservoirs are used by the company, except the Sugar Loaf reservoir, which has not yet been used as we have not yet been able to store a very great amount of water in it, on account of the State engineer who refuses to let us have it,—perhaps he is saving it for the Kansas people.

This Sugar Loaf reservoir was established by an act of Congress March 2, 1897, by which the Government set aside a certain area there for the construction of a reservoir. It was afterwards abandoned by the Government and sold under another special act of Con-

gress to be completed and devoted to the impounding of water from the Arkansas river. It was purchased from the Government by John H. Poole, and we bought it from him, and also some adjacent land. The number of acres I do not now remember, but it is quite large.

2469 We aim to fill these reservoirs from the flood waters when we can because we are never sure of the other, and it is our purpose and practice to store as much of the flood waters as possible. It is then used as the company needs it from time to time.

I think our operations have considerable effect on the equalization of the flow of water in the Arkansas river. If the water had remained to be used on the land which we purchased I do not think so much of it would have returned to the stream, and it would have been returned at different periods; while under our use of it for industrial purposes there is a constant return flow of about 75% of, say 9,000,000 gallons per day at present. This flows every

2470 day regardless of season or weather or anything of that kind.

The Colorado Fuel and Iron Company, the present company, was formed by consolidation of the Colorado Fuel Company and the Colorado Coal and Iron Company.

The Colorado Coal and Iron Company was organized sometime in the seventies, and it initated the steel works at Pueblo, and was also engaged in the coal business. It had previously absorbed 2 of 3 other companies, whose names I do not at present recall.

The Colorado Fuel Company was organized in 1883. It was engaged in the coal business and absorbed the Elk Mountain Fuel Company and the Denver Fuel Company.

The consolidation was made in 1892 and immediately after the consolidated company absorbed the Grand River Coal and Coke Company, a coal mining concern on the other side of the range.

The Colorado Coal and Iron Company was a considerable user of water as early as 1884 or 1885.

2471 Some of the products of the present company are used in Kansas. I find that during the last year we shipped into Kansas 225,000 tons of coal, worth at the points of delivery exclusive of freight charges, over $350,000, the larger portion of that going to points west of Hutchinson. A very large proportion of the fuel used in western Kansas comes from Colorado, and we furnish probably 5/6 of it, maybe more than that.

I know of no coal mines in western Kansas. Our coal mines are situated with reference to western Kansas as well as any other mines, there being a down hill haul all the way.

I do not know much about the coal mines in the Indian Territory or in central or eastern Kansas, but I understand that the

2472 coal is not as good for steam purposes as the Colorado coal.

The smelters and other large users of fuel in Colorado get a large percentage of their coal and coke from Colorado mines, and of that we furnish a very large proportion, much larger than any other one concern in the State, probably several times more than all

the other concerns in the State. We also furnish coal and coke for the operation of smelters and other industries in Idaho, Wyoming, Montana, Utah and New Mexico, and some coke even goes into Old Mexico.

We furnish coal to railroad systems operating in Colorado and some of the adjoining territory. Some of our anthracite coal goes farther west.

2473 If the water supply of this company were cut off it would close everything down, as neither coal, coke, steel nor iron could be produced without a considerable use of water, much more in the production of steel, iron and coke that in connection with the coal.

As the use of water by smelters, reduction works and other institutions of that kind in the Arkansas drainage of Colorado, I tried to get at that, and what they seem to regard as use of water would amount to about 500,000 gallons a day for the smelters at Pueblo and along the Arkansas river, and at Leadville, but their basis is not a proper one. When they figure on the water they use, they mean that which they take in for steam and purposes other than cooling. They do not count that which is returned. If the

2474 amount of water they take in for cooling were included, it would be much larger, but they do not consider at all the water that is returned.

A great many of the towns and cities along the Arkansas valley are users of coal produced by the Colorado Fuel and Iron Company, but I could not say certainly that most of them were because there are other companies which are also supplying coal. The Victor Fuel Company is the largest of the other producers.

As to the effect upon the market for coal in case the irrigation of lands in the Arkansas drainage was stopped, I should say it would necessarily devastate the country, reducing the supply which we furnish in proportion to the population driven out thereby,

2475 which would be very large. I think the population in the Arkansas drainage, at a rough estimate, is about 175,000. If the country were devastated by the cutting off of the irrigation water, our properties could not be operated profitably, as it would cut down the demand too much to make operations profitable. That is even if we were still allowed to use water for the production of coal, coke, steel and iron the effect on the markets within the drainage of the Arkansas by the stoppage of irrigation would be so great that it would not pay to operate these industries. If the

2476 lands now farmed by reason of irrigation were devast-ed by the cutting off of the use of water for that purpose, it would simply make this country a desert. It would go back to the days of cattle raising and the cow puncher.

Cross-examination by Mr. ASHBAUGH:

2477 If the entire water supply of Kansas were cut off, I suppose it would be reduced to the condition it was in when they

called it "starving" or "bleeding" Kansas. I suppose it would hurt Kansas just as much as any other country to entirely cut off its water supply.

The Sugar Loaf reservoir is located in the bed of the Lake fork of the Arkansas river, and the dam is right across the bed of
2478 the stream, with outlet pipes in the dam to relieve the ordinary flow of water. The reservoir was finished within the last six months. There is some water in it now. There have been no flood waters since its completion. It has a very large basin and the natural drainage is large, and it has received considerable surface water aside from that which comes down the Lake fork.

The term "flood water" is a very broad one, and is often used to apply to any volume of water above the ordinary flow up to
2479 even a cloud-burst. I do not think that is really a correct definition of the term "flood water." My definition of it would be a volume of water exceeding ordinary high water.

The principal floods in the Arkansas valley this year have been below the Sugar Loaf reservoir.

We built the reservoir with the intention of taking as much of the flood water as the authorities would let us have until we got the reservoir filled. I think that reservoir is large enough and would take care of any rain fall above it, as it is not filled by a ditch which would limit the amount of intake.

2480 The reservoirs near the steel works are filled by ditches taken out from the Arkansas and San Carlos rivers, and run into the reservoirs. We usually fill them in the spring or whenever the water authorities permit us to. They take an account of our priorities and the priorities of others and regulate thereby our taking of water. It is practicable to take water through these ditches when it is higher than normal, but not practicable to take all the flood waters, owing to the want of capacity of our canals and ditches. They were not built with a view to taking a very large volume of water. We do find it practicable to
2481 take water at high water periods, but from a cloud burst there is too much water and too much force to be controlled by these ditches.

The company is a private corporation and has no State or Government help. The auxiliary companies which I have referred to perform some incidental work connected with the operations of the principal company. For instance the Crystal River railroad is almost entirely used to haul our coal and coke to market. That railroad is not in the Arkansas drainage but on the other side of the range.

Nearly all the traffic on the Colorado and Wyoming railroad is the transportation of coal and coke produced by us on the
2482 Purgatory river. That road brings a very large proportion of the steel works fuel supply to the connecting roads which bring it to the steel works.

Of course we would be perfectly willing to have the use of our

products in Kansas increased if we could supply them, and an increase in the population of the Arkansas valley in Kansas would certainly be no injury to the company.

Examination by Mr. CAMPBELL:

The Colorado Fuel and Iron Company, to which I have referred, is the company that is made a defendant in this suit. I could not state the area included in these reservoirs without referring to the map, as I do not have it in mind. I could not even approximate it.

We do not use the water for irrigating purposes at all. It
2483 is used exclusively for manufacturing, mining and domestic purposes connected therewith. I mean by domestic purposes, the uses by employés and others dependent upon the operations of the company. In our use of water we do not use any more than is actually necessary for these purposes, and when we get through with it it is returned to the river.

I have been a practicing attorney since 1869, and in pretty
2484 active practice since that time. I have given considerable study to the question of water rights, the doctrine of riparian rights, and appropriation of water for domestic, agricultural and other purposes.

I would venture to hope that the decision of this suit could not be detrimental to the rights of the Colorado Fuel and Iron Company to use this water for domestic, manufacturing mining or other purposes, but inasmuch as it is made a party defendant and charged with doing things which it ought not to do, I thought we ought to show what we are actually doing.

Assuming that the doctrine of riparian rights (as distinguished from the doctrine of appropriation) prevailed in Colorado as it does in the States east, where the common law doctrine prevails, I am inclined to think that we would even then have a right to take the water of these streams for the purposes for which we now use it, although I must confess that I have not studied the law of riparian rights in this connection very much, as I have not yet got to that stage in the case. I believe it is true that in the States where the doc-
2485 trine of riparian rights prevails, individuals and corporations can take the water from running streams for manufacturing, mining and other purposes. Whether they could be interfered with, unless they did it in an unreasonable and unlawful way and manner, I do not believe I am sufficiently posted at present on the raparian doctrine to answer.

Recross-examination by Mr. ASHBAUGH:

As to our deriving any benefit from furnishing water for domestic purposes to our tenement houses, I think we do in some places, but I am not sure about it. We have a water system in almost every mining town of any size, by which the water is distributed to the

houses as it is in a city, but my recollection is that we do not charge for that water. I know in a great many places we do
2486 not. I do not think it is considered as part of the rent that is paid for the tenement houses, because we have no water measurement, and we base our rental on the cost of the houses, and I am quite sure that the water supply has never entered into it. Usually, we do not conduct the water into the house, but put it into the hydrants along the streets, and if the tenants want to make any further use of it they have to provide for it themselves.

As I said, I do not think the water supply generally enters into the question of rent, for the reason that I gave, and the water systems are all so closely connected with the water supply to the industrial part of the camp that that which goes to the people is a very small item. It is true that the houses themselves would not be worth as much in rental value without the water, as with it, as we could not keep tenants there at all, they would not stay. It
2487 is also true that although there is no separate charge for the water, we do derive a benefit by furnishing it because we get people to live there. If we did not we could not.

We derive a financial benefit from the rent of the houses and premises. That is, we get pay for them, but as to getting any financial benefit from them, that is stretching it a little. It is never *per se* a profitable operation. The water, however, does enter into the value of the premises in the way I have stated.

Redirect examination by Mr. DAWSON:

It would be utterly impossible for employés to live in these camps unless we brought water into them, and the expense of bringing it would be beyond the means of the workmen.

2488 I have been familiar for a number of years with the Des Moines river in Iowa. It rises in northern central Iowa. I was most familiar with it from Des Moines to its mouth. First became well acquainted with it in 1852. There has been a remarkable diminution in the amount of water carried in that stream since I became acquainted with it. The water is not used there for irrigation. I could see no reason for the diminution in this water other than the cultivation of the adjacent soil, and the destruction of timber, unless the precipitation has lessened, and I do not know
2489 about that recently, but I know it did not lessen materially for some 20 years, subsequent to 1872, during which time I was interested in the question of the advance of humidity towards the Rocky Mountains, and procured the Government reports from along the Des Moines river and westward in regard to precipitation. There was no perceptible lessening in precipitation during that time, but since then I have not continued my investigations in that direction.

When I first knew the river, a large part of its drainage area was still the native sod. I lived some distance from the river as early as

1846, when I was a boy. The whole country was wild and there was practically no cultivation at all. It remained practically in its native condition up to 1859. Since that time I think nearly all the tillable land in the country that is not timbered has come under cultivation. I do not know the percentage of diminution in the river flow since I knew it, but below the lower dam where I
2490 lived in the early days we used a ferry to cross the river in summer time. Now, in summer they take some slabs, put 4 legs in them, and set them end to end across the river, and walk across. I should think the amount of water now carried by the river in the summer time is one half less than in the earlier years.

In my early acquaintance with the river the United States spent large sums of money in an effort to make it navigable. They commenced about 1850. I worked several years on this Government work of building dams and locks for the improvement of the navigation of the river. The Government spent $6,000,000. or $7,000,000. on the work, but never completed it. It built some dams and locks, and then turned it over to the State, and the State spent some $3,000,000. more and then it quit. By that time the railroads had got into the State, and the whole scheme of navigation ended.
2491 The steam-boats used to come up the river every spring. I do not think there has been one up the river now in 15 years. The ordinary flow of the river now is not sufficient for navigation. It would be navigable in high water, but the locks have been broken down, so that steam-boats could not get pass the dams.

Recross-examination by Mr. ASHBAUGH:

I lived at 3 points on the Des Moines river—Croton, Keosauqua, and Ottumwa. I never heard of any irrigation there. I am quite sure there was no such thing there then. No, they did not build dams and take water out of the river, and run it into canals, so it was not irrigation which decreased the flow.

2492 Redirect examination by Mr. DAWSON:

The water in the Des Moines river certainly decreased, notwithstanding there was no irrigation.

With reference to the paid up capital of this company being about $26,000,000., and the approximate investment in the Arkansas drainage being $30,000,000., and the apparent discrepancy in the figures, it is accounted for by the fact that there are bonds to the amount of some $21,000,000., the proceeds of which and capital of auxiliary companies have also gone into the property. I do not mean to say that all this went into the property within the Arkansas drainage, however.

Adjourned to November 30th, 1904, at 2 o'clock p. m. at the state house in the city of Denver, State of Colorado.

DENVER, COLORADO, December 7–10, 1904.

OLIVER P. WIGGINS, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I was eighty-one years of age last July, and live at Denver, Colorado. I am bailiff in the district court of the city and *and* county of Denver. I first came into Kansas in the year 1838. It was near where Kansas City is now located. I came up from St. Louis on a steamer to Independence, Missouri.

I am familiar with the Arkansas river within the States of Kansas and Colorado. I first saw the river in 1838 at Great Bend, Kansas. It was about the first week in November. We crossed the river. I was with a Santa Fe train, on the Santa Fe trail. About five miles from where we then crossed the river we left the river. We were there at the river about a week. There was a good deal of water there at that time. In 1839 I again saw the Arkansas river. That was away west of here. In 1838 we got to Taos, New Mexico, on the first day of December, sixty-six years ago day before yesterday. In 1839 I saw the river about the middle of June; it was at a point near the mouth of Walnut creek, which heads in Kansas, about two hundred and sixty miles from here. Walnut creek and Smoky Hill creek are about six miles apart. At that time I was about a month along the river. We started to go down to Great Bend to guard a train there and we went over to the river and followed it down, on account of the water being scarce all through that country there, and when we got over near the mouth of Walnut creek the water sank and then we had a heap of trouble in getting down from there. We would have to dig holes in some places to find water, and at other times we could get it without digging.

I saw the river repeatedly from 1839 to 1848. (Objection.) In 1840 and 1841 I was on the river. In 1842 I went with John C. Fremont on the Green river, and in 1843 I was with Fremont again at Salt Lake and at Walla Walla, Washington. I next saw the Arkansas river in 1844 at a point below Rocky Ford, near the mouth of Walnut creek. In 1845 I went back East, but came out again in 1846. In 1847 I only saw the river in the spring. There was plenty of water then up to the middle of June, when it began to fail very fast. In 1847 I was a volunteer for the Mexican war. I saw the Arkansas river in June of that year. I didn't see it in 1848, as I was wounded. In 1849 I crossed it. In 1849 I took a wagon train through to California and came back in 1850. In 1854 I went down to the Great Bend to guard the train through again. I saw the river in 1855 in July. In 1856 I crossed the river at Pueblo and went to Fort Bridger. I didn't see much of the river after 1856, nothing more than to cross it.

2500 In 1838 we crossed the Arkansas river at Great Bend, where there was about two and a half feet of water, or maybe three feet of water,—clear, nice water, running pretty swiftly and about 125 to 150 yards wide. That was about the first week in November. We were there for four or five days. In 1839 we started to go down the river again and the river had gone dry. This was a little over two hundred miles out from where Cañon City is now. There were holes of water along the river but it didn't run. That was at the mouth of Walnut creek, at the sand ridge, as we called it. Before that it was all dry there and dust was blowing out of the bottom of it. The river never went dry at Rocky Ford; it always ran there. When I first saw it dry was one good day's travel below Pueblo, to Rocky Ford, and from that on down there was just the water holes until you got down to this big sand ridge and there it went entirely dry. That was the condition of the river in 1839 from below Rocky Ford a short distance to Walnut creek in
2501 the State of Kansas during the months of June and July. Afterwards the train came out to Council Grove in Kansas, about the last of July I think it was, when we left there. There was then a little water in the river where we crossed, about two or two and a half feet, but to take it from the mouth of Walnut creek down, well, a hundred miles below Walnut creek, it was not a running stream that year at all. In the months of July and August, from Rocky Ford to Walnut creek and from Walnut creek to a hundred miles below. It was very dry that season. I was along the river two or three months. (Objection.)

In 1840 the river went dry pretty nearly in the same way, not quite so dry as it did the year before, but there were water holes
2502 all along that year as near as I can recall. We didn't have much digging to do to get water for our stock. There was no water running in the river from about the last week in June until August. We left the river in August. During the time I have mentioned we were scouting and riding up and down the river. (Objection.)

In 1841 the river was pretty nearly the same. I cannot give the months I was along the river that year exactly. We most always went out the middle of June to meet the train down about Great Bend or Big Grove, afterwards called Council Grove, and we would meet the train there sometime about the first of August. By meeting the train I mean that Kit Carson had a contract with the Santa Fe Company to guard the train through from the Arkansas river to Santa Fe, and he most always went with us. The train
2503 was a Santa Fe train of about two to five hundred wagons, what we call prairie schooners, with eight or ten yoke of oxen and eight or ten tons of freight on a wagon.

In 1842 I crossed the river at Pueblo. It was then a nice, clear, running river about two and a half or three feet deep. It was as clear as crystal. Two and a half feet is about what it was, and about a hundred yards wide, I think.

In 1844, about the middle of June, it might have been before or a little after that we went down there, the river was in about the same fix—water holes along. We passed down the river
2504 that year. I think the water ran then fifty miles, probably, below Rocky Ford. After you got forty or fifty miles below it disappeared. Below the mouth of the Pawnee the water seemed to rise. There were big rains in Kansas down there, and the Walnut creek and the Pawnee and two or three other streams there that I don't know the names of furnished the water. The further down it went towards Great Bend the deeper the water got. Some good springs down there helped to supply the water, but generally it was rain that did it. In those years the snows here in the mountains commenced melting very fast in May, and by the middle of June it was pretty well out.

I went back home to Niagara Falls in 1845 and crossed
2505 the river at Big Bend. We didn't go down the river. It was a nice stream there. 1846 was a bad year. The river went entirely dry by the middle of June and the buffalo all left there. There were no water holes on the Arkansas river in 1846, and the Smoky Hill and Solomon rivers went dry, and the Republican went very nearly dry, but the buffalo went north and then the Indians gave us notice that we would have to get out of there or go up to the mountains. We went with the buffalo clear over to the North Platte and to the Republican and went down the Republican.
2506 I was on the river that year from about the middle of June until about the first of July. We were there only two weeks. We had to get out of there on account of water. There was none. We went down the river to this sandy bluff where the water always sinks so bad. The water was sunk all the way from Rocky Ford that year. We thought we would find water at the mouth of the Walnut creek, but we struck none, not a bit, and no game. There we struck a big tribe of about five hundred Indians moving north and east. We couldn't get water by digging for it that year—in 1846. We had to make our way to some little springs.
2507 The Indians understood where the springs were. We struck no water until we got to French Man's creek or White Men's fork. That is about seventy-five miles south of the Platte river.

I didn't see the river in 1847 or 1848. I was lying at Taos, wounded, for fourteen months. In 1849 there were two of us, Sol. Silver and myself, detailed by Kit Carson to go to Independence, Missouri, and take the train through to California for them. We crossed somewhere about this sand hill I have mentioned, two hundred and sixty or two hundred and seventy miles from Pueblo. There were water holes there. We had no trouble in getting water that year. We only went down to the mouth of Walnut creek. We were on the river during the months of March and April. It
2508 had not commenced thawing then, or very little. There was very little water in the river. It ran probably five or six

inches deep and three or four rods wide, but it was continuous. In 1850 I came back from California and crossed the river at Rocky Ford, about the first of July. There was plenty of water there at that time.

In 1854 I was along the river for considerable distances, going down the river only. Coming back we left the river at Rocky Ford and went in a southwesterly course. We went down the river that year about the tenth or twelfth of June. It was terribly dry. There were water holes. We had to dig for water that year. That
2509 was the condition all the way down until we got below the mouth of the Pawnee. Then there was water from there down—good rains and plenty of water. We watered our stock by digging holes and dipping out the water for them. We suffered a good deal. In some places you might dig six or eight feet in the sand and not find any water. That was the case in 1846 and 1854. They were the two terribly dry seasons. These water holes I have spoken of were generally dug in the bed of the stream at the mouth of the creek. The wolves used to dig holes there to get water, but the wolves all had to leave that year, 1845, and also in 1846. We dug holes at the mouth of the stream where it empties into the Arkansas, because the soil was hard, and in the hard soil the water would rise, and it always kind of gouges out at the mouth of these creeks by the sudden run of the streams, and that helped us
2510 out some. A good many springs that year went dry that we all knew of. We would go to those springs and then we would have to go back to the river again. In 1855 there was plenty of water in June and July. I crossed in August at Great Bend and there was water all the way down that year, a nice, big running stream, on account of some big floods up here around Pueblo and around the foot of the mountains—big rains—and that helped us out. There was a big snowfall the winter before, twenty or thirty or forty feet deep, and it took a long time to melt it out; but the floods we had and the high water came from the rains.

During the earlier years that I was familiar with the river it most always went dry in July. (Objection.) I only saw about four seasons that we had good running water in July. As a general
2511 thing it went dry the last of July. There was always plenty of water down there at the fort at Great Bend. I never knew that to go dry. The least water I ever saw down there was about two and a half feet—nice, clear water. In those years I have described as dry years I don't know how the water was above in August and September, but it was pretty dry, I suppose, then, because it was dry up to the first of July.

Q. You have spoken about the buffalo having been driven away from there in one year on account of the scarcity of water.

A. That was in 1846.

Q. Did you ever see them hunting for water at any other time when they could not find it?

A. No, they know enough to go away before the water all dries up. That is one queer thing about them.

2512 1846 and 1854 were the two worst years.

Cross-examination.

By Mr. ASHBAUGH:

The big sand ridge that I spoke of near the mouth of Walnut creek ran out to the river. The river seemed to cut through this big sand ridge. It was on both sides of the river, but higher on the north side than on the south. It was away above Great Bend, I should think, two hundred miles away, and above Fort

2513 Dodge. It was away above Fort Hayes; that is away down on the Smoky hill, close to the mouth of Walnut creek, where Walnut creek empties into the Arkansas river. During the years when we started from here to go down there about June we would be on the river five or six weeks. We would get down to Great Bend and get to the train there and then go right out on the Santa Fe train southwest, leaving the river about five miles west of Great Bend. We took the south branch of the Santa Fe trail.

Q. Was there any high water in the river during those years during the month of June?

A. Yes, sir. In 1855 there was plenty of water, so big we had to ferry the goods across. We couldn't cross with the wagons.

2514 We ferried across the river at Great Bend in 1855. The water came from the big rains in these streams like the Pawnee and Walnut creek and those other streams that I don't know the names of. I don't know anything about what streams entered below Great Bend. I never was five miles below Great Bend in my life. These floods all came from big rains. In the spring early, take it in May and June, then it came from the snows. The river was always well up in May and up to the middle of June; then it began to go down; and those floods lasted about six weeks. The only time I ever saw the river in the fall was during the first week in November, and that was the latest I ever crossed it. I never saw it in December or January. I don't know how long the river remained dry during those years when we went down in June and left it two or three weeks afterward. All I know is what I understood from the Indians—that it was very low and dry all winter. That

2515 would be during all the years. It was dry or would very nearly go dry up above there all winter. The earliest I went out on the river to go down was in the spring of 1849, in March and April. I was never on the river during the winter. Oh, I was out on the river to the forts, and it was always a little bit of a stream, and frozen up,—didn't amount to anything in the winter time. Several times when I had to go out from Taos to hunt for the forts—Carson had a contract with the forts to hunt buffalo for them and

the soldiers hauled them in and we would have to go there just after it began to freeze up, because the water was so terribly low and any little frost would freeze it solid and then the buffalo would go off into the hills to the springs. The forts I refer to were Bent's
fort. The forts were away above the sand ridge—west of the
2516 sand ridge. The buffalo knew the river was going dry. When the buffalo were going to leave the Indians would give us notice then to get out of there—to go to the mountains or to go north. If we went to the mountains the Indians always wanted to go with us, because we were well armed and they had nothing but bows and arrows, and if we went to the mountains the Utes would come down on all of us. During the times we went down the river in June there was no high or flood waters, more than when there came up a big thunder shower it would raise it a foot or two and go down within a few hours.

Q. During those times when you went down the river in June was there such a thing known as high or flood water in the river at that time?

A. Nothing more than when there came up a big thunder shower it would raise it a foot or two and go down within the next two hours.

Q. That was always, then, in the month of June after the snow was melted in the mountains?

A. Yes, sir. We hardly ever have any storms in this country until the last of June or July. July is our month for that.

Q. Then it is your recollection, is it, Mr. Wiggins, that the waters formed from the melting snows always were out of the way before you went down in June?

A. By the middle of June the snow water was run off, except this one year 1855. That year there was so much snow fall in the mountains it kept up a big supply all summer.

Redirect examination.

By Mr. HAYT:

2517 This sand ridge I have spoken of is away down below Bent's fort. I don't think the sand ridge was as far from Rocky Ford as from Great Bend. We had no way of measuring distances in those days except by the distance we could travel in a day. So many sleeps. That is the way we counted it.

2519 FRANK B. BALDWIN, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I am sixty-two years old, past. I am at present brigadier general of the United States Army, commanding the Department of Colorado, with headquarters in Denver. I have been connected with the

United States Army for a little more than forty-two years. My duties in the army have taken me into the State of Kansas and upon the Arkansas river. I came to Kansas first in September, 1866. I was then first lieutenant in the Thirty-seventh infantry, and in command of a company. In going up the river from the south I landed at Fort Leavenworth and remained there a few days and then marched to Fort Riley, and then to Fort Harker, Kansas. Fort Harker is near the town now known as Elgin. I marched from Fort
2520 Harker to Wichita in November 1866. We were, I imagine, about a week on the road going down with foot troops. It was probably the last of November or the first of January. In September, 1867, I left Fort Harker en route for New Mexico in command of the 37th infantry. We didn't exactly get to the river until near by Fort Zarah. Then we marched from there virtually in the valley of the Arkansas river to Fort Lyon. Fort Lyon is about thirty miles up the river from Bent's old fort. That was in September. We arrived at Fort Lyon I should say about the first of October. There we crossed the Arkansas river and went up the
2521 Purgatoire and crossed over Raton pass and into New Mexico. I remained in New Mexico until the winter of 1868-9. I spent the winter of 1869 and all the year 1870 at Fort Hayes. I was quartermaster there. During that time I very frequently crossed the river at or near Fort Dodge. I was transporting supplies to old Camp Supply, in the Indian Territory, even going down as far as Fort Sill in Oklahoma. Rather late in the fall of 1871 I was sent over to Fort Larned in the Arkansas valley, on the left bank of Walnut creek. I may have the dates a little confused. There as quartermaster I had a great deal of transportation and shipping to do, crossing the Arkansas river up the river to Fort Dodge and down the river to Fort Zarah. Fort Zarah is not very far above where Great Bend is now.

I have crossed the Arkansas river innumerable times almost all the way from Pueblo down to Great Bend and at Wichita with troops and wagon trains, and have travelled along its banks
2522 during those years. We couldn't get away from the river. In marching out from New Mexico we had to keep to the banks of the Arkansas. Between Fort Zarah and Fort Larned the channel of the river was very often a great wide sandy bed with no appearance of a river or anything of the kind, and then again we would find it probably for some miles running water. The banks are always low. There were no precipitous banks at all. I think I can describe the appearance of the Arkansas river a great better by repeating what Senator Depew once said about the Rio Grande—that it was the only river he had ever seen where the sand was on top and the water underneath. I don't suppose there is a month of the year in which I have not crossed the Arkansas river or travelled up and down its banks. Sometimes without warning a tremendous flood would come down the river that would tie us up so that we

couldn't cross it. I have been tied up that way as many as
2523 five days at a time, and at the end of that time the water would almost entirely disappear. There would be no water there at all. We never used to hesitate to march on trips along the Arkansas river or to cross it, and never hesitated going into camp if there was not even a sign of water, because we never failed to get water by going down a foot or two or three or four feet. I have tried to cross the river several times with wheels, and it was not infrequent that we would have to dig our wagons out of the sand. It would turn dry and the least wind would keep the sand moving. If we had the troops, even with foot troops, we would march in two lines the width of the wagon back and forth two or three times until we got it treaded down so that the water would almost appear on the surface, and then it would be packed hard enough so that the wagons would go over it without any trouble. It was on account of the quicksand in the bed of the river, and as we treaded it down the water would come up and the wet sand would carry the wagons better. The conditions I have just spoken of in reference to the river being dry would extend for varying distances. Sometimes it would be twenty-five or thirty miles and then again there would be a rippling of water on top and this water would rise almost invaribly at night when the sands would be damp and sometimes the water would come up and be flowing in the morning, but as soon
2524 as the sun came up it would disappear. This dry bed of sand extended all the way from Larned to Bent's old fort. After we got to Bent's old fort I never saw the river dry above. I should say that Bent's old fort was about sixty or seventy miles below the present town of Rocky Ford, and about thirty miles below Fort Larned. I have never seen the river bed perfectly dry during that whole distance. I have seen it when the water was intermittent. It would run a few miles and then disappear, as it does in all those streams down there,—the Cimarron, etc.

2525 As to floods, I can say this, that in June, July and into August we always looked for the Arkansas to be full of water, and it was attributed by people who pretended to know that this was caused by the melting of snows in the mountains. In other months of the year we would have those tremendous storms and the river would rise almost without any warning at all of its coming, and would go off about as fast as it came. That was attributed to heavy rains or cloudbursts or something of that kind, and it ran off very quickly. It was seldom more than 24 hours that we would have to wait for it to run off. I remember one year the buffalo hunting for water. I think it was in 1870 or 1871; I would not be sure about that. I had a big train at Fort Dodge going down to Fort Supply with it, and we had to dig for water at Fort Dodge. I camped about three miles down stream from the post and the buffalo were apparently crazy for want of water. We dug these holes and we could scarcely keep them from the holes and get our mules down

there to water, on account of the buffalo crowding in. That
2526 was on account of the scarcity of water. There was no water in Walnut creek that year, which was quite remarkable, because Walnut creek has always had more or less water.

In July, 1874, what was known as the Indian Territory expedition against the Kiowas and Comanches was mobilized at Fort Dodge, and we crossed the river there dry shod. There was not water enough in it to fill a canteen; that is, on the surface; that was in July. We crossed it right opposite Fort Dodge. In 1871 when I crossed it it was, as I have already explained,—there were places where it would be perfectly dry, and at other places there would be water. That is the normal condition of all those streams—the Smoky Hill, the Cimarron, etc. We could travel along the bank and see running water for a few miles, and then there would be absolutely no indication of water at all.

I have been more or less familiar with the river from 1866 up to the present time. I went clear down to a little town called Chilocco, where there is an Indian school, by railroad. We travelled a good deal of the distance along the Arkansas river, and of course in travelling east on that road I travelled over that portion of the road in the night, and coming back I could see everything on the
2527 return trip in the daytime. I was interested in seeing the improvements of the country, and that led me to watch the conditions and note them carefully, with no idea other than to see if there were any changes in the river and in the conditions.

From my observations extending over this long period of years from 1866 up to the present time, I do not note any material changes in the condition of the river as to water since 1885, as compared with the conditions existing prior to 1885. I don't think I have seen sufficient difference to even call to my mind the comparison. I know that the country along the Arkansas river has advanced in every way perfectly marvelous—absolutely surprising. I would not have given a nickel an acre for the whole country west of Wichita when I first went out there, and now you see fine big farms and everything growing there that will grow in any place in the world. In my judgment, there is just as much water in the Arkansas river on the average between Great Bend, Kansas, and Rocky Ford,
2528 Colorado, as there was prior to the year 1885. (Objection.) I can say that without any hesitation whatever. I can add to that, that I make this statement backed up by the wonderful improvement in the country along the Arkansas river. As to the months of July, August and the early part of September, we always expected to see water in the river during that time. I never saw the time in those months when the water was not running in the Arkansas, but it sometimes got rather low—just a little rivulet sometimes. It usually commenced to get low from the early part of September and on up until the next June. I am speaking now of the time when it got almost perfectly dry in places. This did not occur frequently during the months of July and August. Of course

it depended, I suppose, a great deal on the amount of snow in the mountains that was melting and coming down. It usually
2529 got lower in July and August than prior to that time. It dwindled down so that by the latter part of September there was scarcely any water at all. I do not recall any time when we had to dig for water for stock in either the month of July or August, because in those months we always expected to find water in the river. There would always be some water running, but not very much. It depended on the snow fall for its source of supply.

Cross-examination.

By Mr. ASHBAUGH:

I do not recall that I have ever been at such a place as Garden City. I don't recall the location of Garden City. I don't think I was ever in such a place. It is probably a town that has been located and built up since I have been in the country. I have come up through from Larned west by rail. There was no such
2530 town there when I was stationed on the river. I think I remember that town now. I was passing through there last July. I was there in July. When I was there in July there was so much water we were held up with the train for two days and couldn't move. This was July, 1904. According to the newspaper reports and weather reports July of 1900 was very wet all over this country. I imagine that it was the wettest year ever known in this country. I was down through the country in 1866, 1868, 1869, 1870, 1871, 1872, 1874, 1875 and in the spring of 1876, and I then again was through there by rail in 1898, 1900, 1903, and
2531 1904. In 1898, as I have explained, the river in places would be perfectly dry and in other places there would be a trickling of water. I saw it dry in several places between Fort Larned and where the railroad crosses the river. I have seen it dry right there at La Junta. We always expected to find flowing water in the river during the months of June, July and August. I mean there would be running water all the time through June, July and August. I have seen it twenty-five feet deep, and then
2532 again not an inch deep. The whole valley would sometimes be absolutely flooded with water. You could not get near the bed of the stream. Of course this would not be the average flow of the river at all, but that is the best description I could give of it. I would see it in that way, and then again there wouldn't be more than an inch of water. When the water was flowing during these months, say from Fort Larned to Fort Dodge, it would be on an average from one to two feet deep. It very seldom came up over the axle trees of our wagons. It was then fordable. I have seen it when it was not fordable. I have been tied up repeatedly on the banks of the river, as I have explained, on account of very heavy rains or cloudbursts or something of that kind. That is what we feared more than anything else. We never thought of the high

water of June, July and August. We felt that we were always sure of finding water in the Arkansas river during those months, that is all, and during those three months we very seldom had high
water from rains. This water during those months was at-
5033 tributed to the flow from melting snows. I couldn't say of
my own personal knowledge that that water did not come from rains in Kansas. I am only giving the expressions and understanding I have gathered from people whom I have known, that it was the result of melting snows. That was the source of the water supply. The months of June, July and August were not months when we had the rains in Kansas. I don't recall anything of that kind, nor any rise of water in the Arkansas river from those sources. If it did come I don't know anything about it. I never observed any irrigating ditches at Garden City. I only know from descriptions pretty nearly where it is. I don't know anything about it—that from about 1880 to 1887 there was plenty of water in the river to supply these ditches at Garden City. I don't know that since
that time they have not had any water to supply them. My
2534 observation has not been such as would warrant me in answering the question affirmatively or otherwise. (Objection.)

Redirect examination.

By Mr. HAYT:

I have heard the supply of water in June, July and August attributed to the melting of snows, but I don't know anything about it myself. I simply know that we looked for water during those months, and people who should know that country would always say that this was the result of melting snows, and that has been my experience with reference to other mountain streams—the Yellowstone, the Cimarron, etc. I know that in the Yellowstone it came from the melting snows in the mountains. As to my statement on cross examination that the water was high in the Arkansas river in
June, July and August, I wish to be understood as saying
2535 that there was more water in the river. Possibly on one or
two occasions, but very seldom, we were detained on account of high water in those months in crossing with wagons; and when I speak of finding water there I mean we found sufficient water for our stock. We always found sufficient for watering stock. We never hesitated to camp along the banks of the Arkansas river no matter what was in sight. We could always find water. In fording the river ordinarily during the months mentioned the water would very seldom go above the axle trees and the wheels would sink into the sand more or less.

2536 HENRY HEGWER, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I live at Denver, Colorado; I am sixty-one years old; I am a contractor and builder. I have lived in Colorado permanently since 1889, and was State boiler inspector for the State of Colorado for two years. I have also lived in the State of Kansas. I came there in November, 1857, and lived there until 1879. When I came into Kansas in 1857 I was fourteen years old and come there with my father and mother from the State of Wisconsin and settled in Chase county on Diamond creek, eight miles below the old Santa Fe trail, at Diamond Springs.

2537 The first time I saw the Arkansas river was in 1859, in November. We were hauling hay from Council Grove to Larned, Kansas, for the Government. Fort Larned was about four miles from the Arkansas river. The country at that time was called the Great American desert, and I think it was very well named. At the present time the country is most fertile, as good as any in the United States, I think,—as productive. I saw the Arkansas river again in the early spring of 1860. We also hauled hay during that year. I think the next time I saw the river after 1860 was in 1867. I saw it quite a number of times in 1867. The next time I saw it was in 1871. In 1872 I moved to Hutchinson, Kansas, and lived there until 1889. At Hutchinson I was engaged in farming a big part of the time. I also saw the river in the fall of

2538 1865 and the spring of 1866. I had forgotten that. I had a contract there at Fort Zarah. At the time I camped upon the banks of the river in 1859 there was no water in it. That was near Great Bend, where Ellinwood now is. Ellinwood is six miles east of Fort Zarah.

In the fall of 1859 we travelled the river from Great Bend to Larned, making four or five trips. The distance is about thirty-five or forty miles. The river was dry all that time, and we got our water out of the Walnut and then out of a big pool on Ash creek. We got our next water out of the Pawnee. I was there in November and December, 1859, and in January and February, 1860.

2539 The buffalo were pretty scarce at that time. It was on account of the drought that they were scarce. The first herd of buffalo that I had ever seen in my life was in 1858. That herd extended in width from Cottonwood, on the old Santa Fe trail, to Great Bend or over onto the Walnut, a distance of about eighty miles. They passed a given point for seven weeks. They left the country absolutely barren of everything. There was nothing left but wallows—and the surface of the country was as rough and barren as you could possibly imagine. There was not a sign of vegetation

anywhere. The next year the river was dry and there were no buffalo there.

In 1865 I had a beef contract at Zarah. We drove the cattle there in the fall. There was some water in the river when we came, but along in the spring we had to take them away from there and drive them up the Walnut river for water. There was not
2540 sufficient water for stock there in the fall without digging for it. In 1867 I was contracting with Sharp and Shaw of the Kansas Pacific road at Fort Harker. I then took a contract for supplying them with buffalo meat and I established a camp on Plum creek. While I was hunting buffalo there we often ran down as far as the Arkansas river. It was about the middle of August when we reached the river and we stayed there for nearly a month,
2541 and finally were compelled to leave there on account of the scarcity of water. There was not enough water for our stock. When we went there there was quite a little flow, quite sufficient for our use. As to the other years about that time, as a rule in the spring of the year there was always water in the river, but along in the fall of the year especially it was scarce always, especially from Granada down to the mouth of Cow creek. The distance between these two points is about 200 or 250 miles I think. As to the bed of the river between the points named, well, there is a large ridge of sand lying along the south bank, in many places running clear across the river; that is, the river runs through the sand ridges and in heavy wind storms very frequently it would drift entirely over across the river, so much so that when the water raised *when* and freshets came it would bank up high and finally break over *the* wash and channel through again. The river bed the whole distance was composed of sand. The banks were very low, averaging possibly two to
2542 four feet. The last time I think I passed up the river by wagon was in 1880. I have passed down by railroad several times. I homesteaded on the Arkansas river for six months, in 1874 I think it was. This was six miles west of Hutchinson. Part of the land I farmed lay across the river and I had occasion to cross it every day. I lived there several years; the balance of the time I lived on the river at Hutchinson, and during the years I have mentioned I had occasion to see the river every day. In the spring of the year there was generally a fair flow of water, sometimes
2543 bank full, and in low places it would overflow. In the fall of the year there never was a time but what you could walk across it. I don't remember a year but what you could walk across it without wetting your feet. As a rule, in the month of July there was some water, but it was always so that we could cross it. The difficulty in crossing it would be possibly in May and June. There was always enough water for stock in July and August.

I built an irrigating ditch for my homestead in Kansas in connection with my neighbors living east of me. We took out the ditch from the Arkansas river. We completed the ditch, but by the time we got done there was no water to run in it. There never was

a time while I lived there that there was any water in the river when it was necessary to irrigate. I mean when it got dry and warm the river had no water, and when we did have water there was enough moisture and rain so that it was not necessary to irrigate. The farmers in that locality depended entirely upon the rainfall to produce crops. They did then and they do yet.

2544 There has not been a time from the time I first saw the country but that it has improved constantly, and more rapidly in the later years since they began irrigating in Colo-

2545 rado. In the early days when that country was hard and dry it was an American desert, and it never rained only when it poured down. It came in great storms sweeping over the prairie at such a rate that you couldn't hold your hat, and we would have to back the wagons up against the storm to keep the wind from blowing them over. These conditions do not exist any more in these days. Of course thunder storms come over the country, but they are mild and most generally small, little drizzling rains, to what they were then. I attribute this change to the cultivation of the soil, the irrigation of the lands, the planting of trees and orchards, and everything of that kind, holding the moisture, instead of the surface being dry and hard like a paved street, run over by the buffalo, for then when it did rain and these great storms would sweep over the country the water would run off into the gullies and streams and down into the creeks and rivers and the next day the wind would be blowing the sand the same as before. That same country where we had to haul the hay in those days to feed the horses is now supplying us with hay. We get a great deal of the finest hay in the market in Denver from that country,

2546 and even from farther west. The grass when it rains holds the moisture. It soaks down into the ground, and when it gets warm you can see the steam rise, and in the night when it gets cool you can see the grass wet with dew, something that never could have occurred in those days, because there was no grass for the dews to fall upon and there was no dew to fall upon the grass.

We built the irrigation ditch I have spoken of in June and July, 1874. I have seen the progress of irrigation, and it surprises me wonderfully, at Fort Collins, Colorado, in 1862. Others living in the vicinity of my homestead in Kansas were cognizant of the fact that irrigation was going on in Colorado all those years. We all knew it. It was a general matter of discussion among the farmers of that locality, and many along the river thought they would like

2547 to dry it, but after my neighbor and myself tried it and found we couldn't get any water out of the river to irrigate when it was necessary there didn't any more of them want to try it, and in fact the seasons improved so much that we found it was not necessary to irrigate.

I want to state that in the year 1858 when I saw my first buffalo we were up on the Smoky hill where Salina stands now. They had rooted up the country so dry and bare that there was nothing for

our cattle to eat. We were there three days and had to cut down the cottonwood trees to let the cattle browse on them while we stayed there hunting, and the leaves on those trees were brown and dead, I imagine from the sun shining on the sand and what they called the hot winds that scorched and rusted the leaves of the trees until from all appearances you would think the trees were dead.

2548 There were very few trees along the streams. There was a little timber on the Walnut and the Pawnee—a little more than on any of these other streams. These were all cottonwoods. At that time there were some trees up and down the Cottonwood, and down below Marion Center there was quite a little bunch of trees, and when you got farther east you would find oak and hickory and ash and all that kind of timber. They have got all kinds of forests in that country now. The increase in the acreage of the timber has been quite extensive for the last fifteen or twenty years.

Crops in Kansas perish in some years by reason of droughts. In 1860 we lost everything, and we had partial failures in other

2549 years, but not as much as that year. When those dry years came it affected the crops up to the banks of the stream. There was no perceptible difference; in fact the corn on the very sandy soil would wilt before that on the uplands—would show the drought—because the highlands as a rule in Reno county have a sub-soil of slate and soapstone. The sand would dry out so much that the crops would be poorer in the valleys and along the sandy lands than up on the high lands. I sold my place because it was too sandy. My place was on the river, and the crops didn't do as well as they would on higher grounds to-day.

Q. You have never heard any claim made that the crops on the bottoms got water from the river?

A. Well, there might have been spots, but I never saw any where it was very low. If there was it was so low that when there was water it would overflow.

2551 Cross-examination.

By Mr. ASHBAUGH:

I located my homestead in 1873 on the north side of the river. The corner of it ran about three hundred yards from the bank of the river. And then I claimed a quarter section of school land that ran across the river. I sold my homestead in 1881. It was bottom land—sandy. In spots there was some loam. We reached water at about five feet anywhere, and we supposed that would be about the level of the river. I had a drive-well and drove it right down through the sand about thirty or forty feet to get water. We couldn't dig a well because it was nothing but quicksand when you got down in there and it would cave in on you and you

2552 would get to quicksand just as soon as you got below the surface, about a foot or two. Another reason we didn't dig any wells was because the surface water wasn't fit to use, as a rule, and

when you would drive a pipe down thirty or forty feet you would get good water. My land was underlaid with quicksand. My land was not considered the very best. I don't think it is considered the best land to-day.

I lived in Kansas in 1889. I have been down there three
2553 or four times. I can't recall the dates. I passed through there two years ago on my way to Washington, over the Santa Fe. The valley there back to the foot hills is about three miles wide. Cow creek runs between the place I took up and the sand hills, and the Cow Creek bottoms, as a rule, are not as sandy as the Arkansas bottoms. In 1874 I had about ten or twelve bushels of corn to the acre. It was sod corn. We had some turnips. In
1875 I had one piece that yielded from fifteen to twenty
2554 bushels of corn and another that yielded about sixty bushels. My corn crop was better in 1875 than in 1874, because it was owing to the condition of the soil. It was older. It was ploughed and loosened up and it was more productive. I think it was not any wetter in 1875 than in 1874. In 1876 my crops were fair. Corn crops were always pretty fair, and I always raised some pretty good wheat there. I couldn't say just exactly just how much I raised, but my crops were pretty good. Yes, crops were pretty good there in 1874, generally, as far as the older lands—lands that had been ploughed two or three years—were concerned. It was better than land just ploughed. I think the crops in 1874 were about the same as in 1875, and I don't think there was very much difference between 1875 and 1876. About 1878 there was some short crops in there, but I can't tell which years they were. We always suffered more or less in the fall of the year for want of rain, but the crop averaged good, especially small grains. In 1871
that was a barren country and there was nobody there at all.
2555 The Santa Fe railroad ran as far as Newton in 1871. The road was extended up to Hutchinson, and in 1872 C. C. Hutchinson started that town and the people went in there and took up homesteads. I was down in that country about three years ago, when I passed through there. I just passed through there at that
time. Since 1889 I have passed through Reno county once
2556 and went there once. The observations I have made have been based upon these two trips, and this one visit since 1889. I was up about Garden City either in 1873 or 1874 and made a trip to the river. There were a couple of little ditches there. I think "Buffalo" Jones had a ditch and about two hundred and sixty acres of land, and had nice crops. The last time I stopped off in Garden City was in 1880.

When I spoke of the river being dry in the fall of 1859, I will state there was not a general drought over all this western country
in 1859 and 1860. The drought came after that. This was
2557 just before the drought. In 1859 it was good, you know. In 1860 was the drought. There was no rain in that country at all in the fall of 1859 or during the spring or summer of 1860. The

great drought was in 1860 but 1859 was a very productive season. It commenced getting dry in the fall of 1859. I don't know whether it is deeper to water in than country now than it was then or
2558 not. I don't know whether it is deeper to water in the wells than it used to be. I spoke of the river being full of water in the months of May, June and July. This condition was regular every year. (Objection.) I have known lots of times at Hutchinson when you couldn't ford the river. It was generally in the spring of the year—May, June and July. Whenever there was
2559 plenty of water in the river we always had plenty of rain. I never went up to the source and don't know where the water came from. The rainy season during those early years was generally in June and July. It hardly ever extended into July. Sometimes it did. It strikes me that the grasshopper year in Kansas was 1873, because I am quite sure it was the year after I
2560 went to Hutchinson. It might have been 1874. We didn't have good crops in Reno county in 1874. The country was too new to have good crops. I raised some sod corn—about ten bushels to the acre.

2561 Redirect examination.

By Mr. HAYT:

I took my homestead in the fall of the grasshopper year. I took it from a fellow that gave it up on account of the grass-
2562 hoppers, then I moved onto the homestead the next fall; so that if the grasshopper year was 1874 I moved onto the homestead and built a house there in 1874. I am not sure about the grasshopper year. I think it was 1873, but still it may have been 1874. It was so dry during those years that it is hard to make a comparison one year with another. I went up to Garden City and saw that little irrigating ditch the year after the grasshopper year, the year after I took my homestead, and if 1874 was the grasshopper year it was 1875 when I went to Garden City. It was at the time when Garden City was the end of the Santa Fe road, and
2563 Garden City was established, and "Buffalo" Jones was there. When I speak of high water in the Arkansas river during those years I mean a flow of two or three feet of water. During June and July the water would run up pretty high
2564 to the wagon box when you undertook to ford it; the balance of the time it was away below that. After that it would get gradually lower and lower until the fall of the year you could go across without wetting your feet. During the month of August, unless there was some rain—showers—it was generally dry. We usually had more rain during the months of June, July and August than in any other months.

2566 LOUIS G. CARPENTER, Denver, Colorado.

Cross-examination.

By Mr. ASHBAUGH:

In my direct examination I gave the drainage area of the Arkansas river. The whole area of the Arkansas river down to
2567 the Mississippi is about 186,000 square miles. If on my direct examination I gave the drainage area of the Arkansas river above Cañon City as 2,600 square miles, that was about correct. The drainage area of the Arkansas river in the State of Colorado is about 26,000 square miles, as I recall it. The drainage area of the Purgatoire river is in the neighborhood of 3,000 square miles.

The average rainfall on the plains of the Arkansas river in the State of Colorado is about 14 inches. It will not be above
2568 16, and probably not less than 14. The earliest record is at Fort Lyon, which is now called Las Animas, which runs back to 1871, I think, to the organization of the Weather Bureau. The average rainfall in the Arkansas valley in the western portion of Kansas is of course the same as that in the eastern portion of Colorado. As a whole, it may be said that the rainfall tends to increase as you pass eastward from the mountains, especially after you pass eastward the first hundred miles. There is a progressive increase, reaching 20 inches at Dodge City and 30 inches at Wichita, and an increase as you reach Arkansas City. From Dodge City west to the State line the average rainfall I should say was about 18 inches, and I think at the western border of Kansas it is close to 16 inches. The measurements at Dodge City go back to 1874. I think there are no continuous set of measurements along the Arkansas river proper west of Dodge City. There has been "fugitive" measurements, but not continuous, so far as I have been able to determine.

Referring to plate No. 113, as shown in Defendant Colorado's Exhibit 23, I think the date when that plate was prepared is
2569 shown by the date of publication. It is in the Annual Report of the United States Geological Survey for 1899–1900. The date of the preparation of the monograph of course I do not know. It must have been before the time of publication, and I think not long before. It would be my supposition that it was prepared within a year or two before that. I think this plate does not profess to show what the condition of the river was in the earlier years, long prior to the preparation of the plate. It is a map without explanation as to the date when it was prepared.

Defendant Colorado's Exhibits 4, 5, and 6 were introduced, showing certain measurements of floods in the Arkansas river during the year 1904. I think I presented one of a previous year also.
2570 Those of 1904 were made by different parties under my direction. These measurements were obtained by observers under

our different instructions and for different purposes; that is, they were to observe simply the river on a gauge fixed on rods by us, and they were to simply note the height of the water. At several places gauges were fixed by the United States Geological Survey and we used the same gauge where that gauge was situated so as to be a good record. One place was at Dodge City and another one at Hutchinson. At Wichita it was put in place originally by the United States Weather Bureau. At Arkansas City we put in a gauge ourselves, and afterwards the Geological Survey put in one
2571 on another bridge. Another one was established at Kinsley and another one at Garden City. These two were established by Professor Meyers. The gauge at Kinsley has not been in existence except for 1903 and 1904. It was read by a young lady who lived at the nearest house, which was the only house adja-
2572 cent to the gauge. The person who read the gauge at Garden City was simply employed to report the river as it is on the gauge. During these particular floods I believe I passed down the river at Garden City in addition during the time of the first one or two floods. We had other men stationed there. I was there myself during part of the floods and took some of the readings of
2573 the gauges myself. I know that those readings were right that were taken when I was there. I have not checked up the readings constantly by personal attendance. I have said from time to time that we have had others going there who have taken readings which have corresponded with readings at that time taken by the observers. So far as we can trace people's testimony we have placed faith in them. I don't know whether their readings
2574 are correct or not, from personal examination. I was taking their statements of the height of the water, and I have complete faith in their accuracy.

I stated in my direct examination that the first flood of 1904 went between two and three miles an hour, and that is correct. I
2575 remember another flood distinctly, which was at Dodge City on Saturday mor-ing and reached Hutchinson at six o'clock on Monday evening. The distance from Coolidge to Hutch-
2576 inson is 260 miles, and if a flood went two miles an hour it would of course take 130 hours; at three miles an hour it would take eighty odd hours. That of course is different from the velocity of the stream, that is, the velocity of a cross-section. In the first flood of 1904 between Coolidge and Garden City the loss was 43 per cent.; in the second flood the loss was 41 per cent.; in the third flood the loss was 46 per cent. and in the fourth flood the loss was 48 per cent. between those two places.

I stated in my direct examination from our tables that for the last sixteen years the average flow of the river at Cañon City was about 750 cubic feet per second of time. I stated in my direct examination that water passing the Colorado-Kansas State line would lose about 70 per cent. of its volume by the time it reached Wichita,

and as a general statement that is correct. I will illustrate
2577 this as to one particular flood. In that flood we had 5,700 cubic feet at Dodge City, and at Wichita we had about 1,300 cubic feet, including what came in with the Little Arkansas river.

In my direct examination I made an extract from Major Pike's work, found on page 445, volume II, Coues' edition, beginning: "Sunday November 16th." The next two sentences are as follows:

"*Sunday, Nov. 16th.*—After ascertaining that the Spanish troops had ascended the right branch or main river, we marched at two o'clock. The Arkansaw appeared at this place to be much more navigable than below, where we first struck it; and for any impediment I have yet discovered in the river, I would not hesitate to embark in February at its mouth and ascend to the Mexican mountains, with crafts properly constructed. Distance 11½ miles."

2578 The date I have reference to in the previous quotations which I made in my direct examination I think was October 16. I am inclined to think that Major Pike here referred in the upper part of the river to the navigation of the river in only canoes or buffalo boats or buffalo skins. I think where he refers to "crafts properly constructed" he means properly construeted with exceedingly shallow draft. I think you will find some reference somewhere else, either in that or in Long, to the buffalo boats.

2579 It is my judgment that his idea was, where he speaks of the river being navigable in the upper part, that the navigation was for buffalo skin boats, or, as stated in the previous testimony, for canoes.

In my direct examination I referred to the work on "Kansas and Nebraska" by Edward Everett Hale. On page 115 of the same volume from which I quoted the following paragraph is found:

"It is said, however, that a steamboat can ascend at full water within twenty-four miles of the Great bend—the point where the river gains its greatest northern latitude."

Mr. Hale was not referring to steamboats made out of buffalo skins, but is evidently stating it not on his own knowledge.

2580 The sources of the water in the river flowing at high water in June, July and August come in the largest part from rains, and in Kansas most of the water comes from rains. June, July and August in Kansas are the heaviest water months, as they are in Colorado. Near the mountains in May and June the largest part of the water comes from snows or the rains coming during the same time. In my direct examination I quoted from Colonel Richard Irving Dodge as follows:

"In June when the mountains send forth their flood of melted snow the river swells."

He is stating his opinion of the matter.

I made a quotation from the "Ford County Globe" of July 23, 1879, which was found in the historical library at Topeka. I did not make the extract personally, but I think it was correctly
2581 made. This quotation was made by Mr. Daniels, the librarian at the State Agricultural College of Colorado at Fort Collins.

I do not know that in the very same article, a little later on, this sentence is found:

"On Sunday the river filled up again as suddenly as it went dry."

I do not recall that I gave all of his report, but I think that is all that I gave. If the sentence just read appears on the same page of the paper I would have no more doubt about it being correct than the extract which I gave.

2582 In my direct examination I made an extract from the "Transactions of the Kansas Academy of Science," volume IX, by B. B. Smythe, in which he says:

"In summer when the prevailing winds are south the river is filled with water and no sand is blown out."

I have no doubt that this is his belief. As to his conclusions, I do not guarantee that I believe all the deductions that are drawn. At the bottom of page 131 of this work the following sentence occurs:

"The Arkansas bears evidence of being an older and maturer stream than the Kaw—perhaps because its bed is filled every summer with water from the mountains; perhaps because during each platonic winter there may be many summer seasons when the Kaw is bound in ice that the Arkansas is free to run."

2583 In my direct examination I read an extract from Major Long's dairy, found on page 258. The balance of the paragraph, found on page 258 and concluded on page 259, is as follows:

"The current of the Arkansa- is much less rapid than that of the Platte, but the character of those two rivers in a considerable degree corresponds, in their widely spreading waters of but little depth, running over a bed of yielding sand. The rise of the waters at Belle point takes place in the months of March and early April, with a less considerable freshet in July and August. But to this place navigation is seldom practical for keel boats, from the month of August to February inclusive, though the autumnal freshet of October and November frequently admits their passage."

I quoted from "The Journal of Jacob Fowler," and I recollect that he made some statement somewhere about the ice floating down the Arkansas river, and by looking at the volume again I find that on page 32, under date of November 1, 1821, he makes such a statement.

2584 I made an extract from the works of Captain Chittenden, in which he says that "the Arkansas river is not a navigable stream in this part of its course." He evidently does not refer to the river being navigable in some parts for boats made of buffalo skins. He has had a good many years of experience between the time when Pike wrote and the time when Chittenden wrote also.

I referred in my direct examination to "Executive Document No. 90, of the 49th Congress, first session." At the bottom paragraph on page 2, of the date of 1886, the following sentence is found:

"There is no doubt but that a two-foot channel can be provided whenever the development of the country warrants it, and the river should be for all purposes of law rated as navigable to Wichita, Kansas."

That is the report of Captain Taber.

I referred in my testimony to the Arkansas river being similar to a plains stream. It was such as is mentioned by one of those
2585 quotations read this morning, from Mr. Long, and such as was read in direct examination, from Mr. Chittenden, that the plains streams are streams that instead of receiving perennial tributaries and an accretion to their volume from springs tend constantly to decrease for some time instead of increasing as most streams through humid countries do.

I referred to an article on the "High plains and their utilization" prepared by Willard D. Johnson, on page 733, the second sentence from the top of the page, is the following:

"Perennial streams, strictly so called, lie below the water plane; intermittent streams above."

In the same volume, at the bottom of page 694 and the top of page 695, the following paragraphs are found:

"It failed in turn, however, because of increasing demands
2586 on the river in the arid belt to the westward, in Colorado, resulting finally in the drawing off of its total run during the growing season. It soon came to be facetiously remarked of this elaborate and well-devised irrigation system that it constituted the finest display of dry ditches in the arid lands.

The out-of-season flow of the Arkansas at Garden still goes by, but large undertakings already on foot looking to storage in the mountains foreshadow the eventual complete disappearance of the river in western Kansas, except as it may from time to time be briefly rejuvenated by floods too large to be manageable."

2587 I referred in my evidence to certain measurements that had been made of the underflow or ground water at Mount Hope, Colwich and Arkansas City, Kansas. These measurements at Mount Hope were made by Mr. Hubbel and Mr. Payne. Mr. Hubbel is a citizen of Colorado and Mr. Payne lived at Wichita, Kansas. Yes, Mr. Payne was employed by me, representing the State of Colorado, and has been in my employ since some time in August, 1904. I
2588 did not make any of these measurements myself. In each of these places a rod was placed at the river at a number of points. At Mount Hope we had several lines of wells. For the Mount Hope measurements, for a line of walls north of Mount Hope, the height of the water in the river is measured from the top of a rim of an iron pier on the east side of the bridge, which bridge is north of Mount Hope, across the Arkansas river. This line of wells is straight north of Mount Hope, on the east edge, I think, of the corporate limits. These measurements were begun from the bridge di-
2589 rectly north of Mount Hope and ran both north and south, going south practically a mile. In my direct examination I did not

give any report of their measurements south. My recollection is, without consulting the notes, that the well three quarters of a mile south of the river at the corner of the road shows lower than at the bridge. It is at a section corner. These measurements south are not completed. We have no other reports of measurements south of the bridge at that point and on that line. We have other wells straight east of Mount Hope and south of the river. They show that the water there is considerably higher at the river three miles east of the point where the observation was taken.

Q. In other words, the water is higher up stream than it is below?

A. Yes, sir.

2590 The line north from the Mount Hope bridge ran about seven miles. There was a considerable rise there in the water level above the water level in the river at the bridge. I do not recall just those figures. The measurement of one set of walls was made directly on that line running directly north of the bridge. I myself was not up over that line, but I know something of

2591 what kind of a country is found up there. From the reports of the observers and from the topographical maps which I examined and used to indicate the points where to locate the wells before they went, I knew the general lay of the country. Shortly north of the river you cross the branch of a creek two miles north that comes near a lake, which I think is called West lake. We had no measurement taken very near it; half a mile away, perhaps. A little less than half a mile, and at a distance of seven miles, they found the ground was hard, clay and hardpan, and found it impossible, with the means at hand, to sink wells clear down to the water. I do not recall any more lakes there. The one I referred to covered quite a number of acres. I do not recall Patterson's lake, at least not under that name. I could not tell how

2592 many lakes are located up there without referring to the map. I could not tell what is the fall of the Arkansas river from the Mount Hope bridge west for one, two or three miles, except by comparing it with the general fall of the river. At Wichita the general fall of the river is about four feet to the mile, and in my direct testimony I gave the average fall all through there as it was then fresh in my mind and I had the figures at hand. The fall of the river at Mount Hope is not far from four feet per mile.

The measurements made on the Colwich line were begun at a bridge as it crosses the river, I think on a township line, and I believe also a mile east of Colwich. It was the bridge nearest to being north of Colwich. The bridge was practically a mile east

2593 and four miles north of Colwich and is located on the southeast quarter of section 27. These measurements were run both north and south from the bridge. We found, south, that the line is running almost parallel with the river and that the wells running down the river were lower than those up the river; that is, well No. 3 was lower than well No. 1 near the bridge. This is prac-

tically the same thing that they found south of the river at Mount Hope. The river in both cases runs southeasterly, although at the Colwich line it runs almost south, close to the road. When they went north from the Colwich bridge they found an increase in the height of the water. In my direct examination I gave the exact figures for the identical dates when the measurements were
2594 made. These holes or wells are there yet and they are continually making further examinations. When they ran
2595 north from the bridge at Colwich they found a well near the farm of Mr. Hansen, a witness for the complainant in this case, which is located about three or three and a half miles north of the bridge. I do not now recall the level of the water found in the Hansen well. I do not seem to have the memoranda here, and I have no recollection of it except that it was considerably above the river. I think it was about nine feet, but the exact figures I do not recall. If in the figures that I gave the river was taken as 2 and the measurement of the water in the Hansen well was 11.70, that would show that the water level in the Hansen well was about nine feet above the water level in the river at the bridge. I do
2596 not mean that that necessarily shows that the bridge is the nearest point to the Hansen well at Bentley. When in my testimony I stated that the water level at the Hansen well was 9 feet above the level of the water in the river, we were taking it on the available line of road which we could use—the public road. This was taking it on a line directly north from the bridge. The bridge is probably not the nearest point on the river to the well, but pretty near it. The fall of the river along there I think is pretty close to four feet per mile. That is my present estimate without remembering the figures. If the exact measurement should show that the fall of the river there is six feet per mile I should not be unprepared to accept it, though
2597 I should think that would be high for that place. The fall of the river varies at places quite decidedly. At Wichita the fall is four feet per mile. If a measurement from the bridge at Colwich three miles up the river would show a fall of six feet per mile, I would not be prepared to say that it was not a correct measurement. Then it would be true that a direct line across from the Hansen well to the nearest point on the river would show a rise in the water level of the river of at least twelve feet above the water level at the bridge. Assuming that the nearest point in the river to the Hansen well is two miles west of the bridge, then according to my figures the water level in the river at the nearest point to the Hansen well would be some three feet higher than the water level in the Hansen well. I have not stated that the nearest point in the river to the Hansen well is two miles west of the bridge. Yes, on the supposition that it may be a mile and a half or two miles or two and a half miles above the bridge to the nearest point to the Hansen well, it would show that the water level in the river was either as high or higher by at least two or three or five feet than

the water in the Hansen well; but this supposition is based on the distance to the nearest point and is based on the fall of the river both of which I do not know; so the correctness would depend
2598 purely upon the supposition. I think this same supposition is not true to so great an extent in the Mount Hope measurement. I have not a map at present available outside of Sedgwick county. By no possible conditions could the water from the bridge north of Colwich reach the Hansen well if the river at that point was lower. Water does sometimes flow up stream. It flows down hill always. At the time when they made these measurements the water would be flowing up hill to run from the bridge north of Colwich to the Hansen well. I will not say that it would be flowing up hill at any time. It would evidently flow on the surface of the ground. I testified as to what I found on those dates. On those dates the water in the Hansen well was higher than at the bridge, and on those dates the water would not flow from the river
2599 up hill to the Hansen well. I think it was up hill from the level of the water in the river at the bridge to the water level in the Hansen well on the dates I measured it. I don't know that the contour of the country and the bend of the river absolutely show that your conclusion necessarily follows from these premises. I doubt it.

2600 The measurements made by us were not extended very far directly south either from the Mount Hope or the Colwich bridge. At Colwich it was a little over a mile. There was no road going farther south at that place, and we also would cross into the Big slough. At Monnt Hope the farthest south was about a mile, at the corner of Mr. Jurgenson's place. We found the level of the water in the well lower than the level of the water in the river straight north. According to the information I have, if you should go up the river from the bridge at Colwich two and a half miles there would not be very much difference in the distance to the Hansen well than when you are at the bridge. I scarcely think that it is true that the river two and a half miles above the bridge is at least half a mile
2601 nearer the Hansen well than the bridge is, though I have not the exact measurement. The river comes from the northwest, and whether that brings it nearer the Hansen well or farther I cannot say. The distance appears to be just about the same from the map I have here. The bridge is on the southeast quarter of section 27, and the Hansen well on the southeast quarter of section 10. His well is in the northeast corner of the southeast quarter of section 10. I think the river touches the southwest corner of the nothwest quarter of section 21. The scaling of the map would show that the northwest quarter of section 21 is over one-fourth and less than
2602 one-half of a mile nearer to the Hansen well than is the bridge at Colwich. If that point is two miles above the bridge then the northwest quarter of section 21 would hardly be ten feet higher than the bridge if the river has a fall of four feet to the mile. The way the river runs it may be more than two miles. It is two

miles west. Assuming that it is more than two miles, of course, and you call it four feet to the mile, it would be more than eight feet. It would not be far out of the way, probably, to say that the nearest point of the river to the Hansen well is ten feet higher than the bridge, with a four foot fall in the river, If the river from actual measurement should have a six-foot fall it would be something over twelve feet at that rate above the level of the water at the bridge.

2603 The measurements we made at Arkansas City were made by the same general method in all those cases. The wells were placed on the roads that were available. The lines were nearly at right angles to the river, I think. These measurements I gave showed that the water was lower at the bridge than at the Hanson well, and of course it could not go up hill. I never have intended to have the court draw the conclusion from my testimony that I thought that the water could go from the bridge to these particular wells whose measurements have been given. If the water went from the river toward these wells it would leave the river from one to four miles or more above the bridge and would leave the river at a point from four to fifteen feet higher than the level of the water at the bridge and from three to five miles away from the wells. Then the distance, if the water left the river even at the north side of section 20, would be something like three miles from the Hansen well, and if the river falls six feet to the mile the north side of section 20 must be at least twenty feet higher than the bridge, taking that distance and that assumed fall.

2604 In speaking of seepage and return waters, I stated in my evidence that they use in the aggregate more than appears to be in the stream or than passes a particular place. If 750 cubic feet per second of time should pass Cañon City, the first ditch that would have capacity to take that amount is the Fort Lyon, and possibly the Amity. If this 750 feet should be taken by the Fort Lyon ditch and should be used for irrigation, the whole of the 750 feet would not be returned to the river and not all of the 750 feet would get down there, even. Certain parts of that water when used for

2605 irrigation would be evaporated and go into plant life. From one-half to two-thirds of the amount of water used in irrigation is evaporated and goes into plant life. If 750 cubic feet should be used for actual irrigation from one-third to one-

2606 half might find its way back to the river and from one-half to two-thirds disappears by evaporation, leaving then, only one-third to one-half to go back into the stream. If one-third finds its way back into the stream by one use for irrigation, when that would be used the second time the same rule would apply, and after two usages there would be about one-ninth of it left, and when this should be used the third time, about one twenty-seventh. When I made the statement in my direct examination I had there in view the return waters and also the full flow of the river. I said that from one-half to two-thirds of the water was used in evaporation

and absorbed by plant life. In the mountains, under a differ-
2607 ent type of irrigation, the loss is greater. Well, I beg your pardon, I think I am answering a little different question there, and inadvertently was thinking of the other side—meaning the amount that soaked into the ground, which would mean
2608 that the amount lost by evaporation in that case would be less. The water in the Arkansas river from Cañon City to the Kansas State line is used over and over again as often as it can be used. The oftener it is used for irrigation the greater the proportion of the original amount that flowed down the river is lost to the general flow of the river. If this system of irrigation as practiced in the valley of the Arkansas river from Cañon City down to the State line should repeat the application of the water to the irrigated fields half a dozen times the greater per cent. of the original amount of water would be evaporated and would find its way into plant life.

Referring to Defendant Colorado's Exhibits 28 and 29, I had these different diagrams so prepared as to show the greater average yield by the lines as they went up on the diagram and the lower
2609 average yield as the lines went down on the diagram. I stated in my examination in chief that if the line goes up it indicates an increase in production per acre. If the reports of the Kansas State board of agriculture are correct they would seem to indicate that. Particular acres, of course, will vary from the aver-
2610 age for the whole county. These diagrams show the production per acre on the average; but of course any average is not a complete indication as to what a particular farm or area does produce. Of some particular farm it might not be any just indication at all. If one farm produced forty bushels per acre and that was the only farm in that county that year, then the average and the production would be the same. If the next year that same farm produced precisely the same number of bushels per acre and there was another farm in that county that only produced half as much, the average would be very different, yet the first farm would, under that assumption, produce precisely the same number of bush-
2611 els with precisely the same number of acres, probably. The diagram as shown in these exhibits shows that the same general conditions seem to be affecting the Arkansas valley, the
2612 Smoky Hill valley and the Solomon valley, and I think it does show that as a whole. I cannot tell you how much bottom land there is in Mitchell county, Kansas. I do not recall as to the bottom land, and in fact I do not know that I noticed the statement made there in regard to it. We had no means of knowing what bottom land there was; we took the counties from the figures and pages that were shown on those tables. We did not have the means of showing the relative amount of bottom land and upland in those counties from those same volumes, that I saw, at least. We were comparing a series of years. We used the biennial report of

1877–8 as largely as any others, but I do not recall that we
2613 used it any more largely. I do not recall that the amount of the bottom lands and uplands in those different counties is shown in that volume of 1877–8 so that I could get a general idea of them. I did not take that into consideration. If this report should show that Mitchell county had only fifteen per cent. of bottom land, and if the yield in Mitchell county rises and falls correspondingly with the yield in another county for the same year, I think it is a fair and true deduction to compare that through the same years with a county that has fifty per cent. of bottom lands. If you compare the yields in Mitchell county for that same year as to whether it was higher or lower, unquestionably that would be unfair, but we tried to eliminate that by showing that they both rose and fell together. Usually the bottom lands in Kansas were settled first. I think that was universally true. The figures that were put upon these diagrams varied somewhat and began
2614 about the year 1873. They began just as soon as we could get the figures from these reports. Probably the year 1873 was about the year that the great tide of immigration began coming into the eastern range of counties. I should think it probable, but I have no personal knowledge of that, that the bottom lands in these counties were settled first and the yield per acre was higher upon the bottom lands when they were first cultivated than it was upon the uplands when they were first cultivated; but I do not feel warranted in stating that as a fact. I have heard some statements to the effect that the bottom lands in Kansas are more productive than the uplands, and I think I have heard some people for some crops preferring the other way. I should suppose the bottom lands would be more productive than the uplands for corn, especially as you go westward.

Q. Hence in those counties in the northern part of the
2615 State, upon the Solomon, Smoky Hill and Saline rivers, the average yield per acre for those first years that you gave in your diagram may have shown the production of the bottom lands?

A. Quite probably to a great extent for the subsequent years, that is, in the western counties.

Q. But for the later years they always showed the production of the uplands, did they not?

A. Well, in those western counties I did not learn that there was much production on the uplands even then.

Q. Then if you should learn that the greater per cent. by far in the later years was on the upland that was cultivated in corn, it would necessarily reduce the average yield, would it not?

A. Why, if the upland had a less yield than the bottom land, it would.

Q. If the agricultural report that you use shows that there is not to exceed fifteen per cent. of the total area of Mitchell county in bottom lands and in the year 1902 that there were over
2616 113,000 acres of corn in that county, by far the greater per

cent. of that area of cultivation would have to be uplands, would it not?

A. Well, I don't know that that conclusion would follow from that statement, without further knowledge.

Q. Fifteen per cent. of the area of that county would be a great deal more than 113 acres, would it not?

A. Why, I suppose so.

2617 Q. Then your figures might show an entirely different state of facts from what was really true, might they not?

A. No, the facts they show are true, I think.

It is the yield per acre that the line on the diagram shows,
2618 and the yield per acre was found first and the line drawn afterwards. In the diagram nothing was said as to bottom or up-
2619 lands. I had the average there for the whole country, which was the data we had at hand, as appears in those reports, and that included the crops wherever they might be. Nothing was said, I think, at all by this diagram that the bottom lands through Mitchell, Saline and Cloud counties and the surrouding counties are less productive per acre than they were twenty-five years ago. That was not the purpose of the diagram at all. Nothing was said in the diagrams about it at all—that the bottom lands in Sedgwick county are either more or less productive than they were in the
2620 former years. The exhibit shows that it is the average for the whole county. The exhibit does not mean to show that any particular part of any of those counties is more or less productive than it was in the earlier years; it is the whole county.

I stated in my direct examination that irrigation was very useful and profitable and absolutely necessary in the Arkansas valley in Colorado, and I think that would even be true in the western part of Kansas. The conditions prevailing in the eastern part of Colorado are largely the conditions prevailing in the western part
2621 of Kansas. If water enough could be found to irrigate the whole valley, a good deal larger area, and therefore a good deal larger number of people would be benefitted if it could apply both to Colorado and to Kansas. Water and moisture is just as much a necessity to raise apples in western Kansas as it is in Colorado.

In referring in my direct examination to the conveyance of water rights as now used in the Arkansas valley, I will add that
2622 the stock which represents them is subject to sale. The water rights are sometimes sold. It is true that a person having a prior right sometimes sells or sometimes attempts to sell his water to some one who may not have any right to it whatever under the law. This sale is more than a willingness to part with his rights. The transfer by sale is not always sale for the party who attempts to sell. I do not know of sales from the parties who have a prior right to water for a single season from one ditch to another where people are under different ditches, but where people are under the same

ditch they may transfer their right or use, and if it were a
2623 temporary use I do not know as it could be called a sale. I have known where parties who, having a right to water and having no need for it, have offered to sell the water to some one else who had no legal right under the statute to that water. I have known where they have taken money, and of a good many cases where they have not been able to transfer their right to the water. The attempt or desire to transfer is one of the difficulties that you have to meet in the actual application of the water under our system. We find some having that desire, but that has to go through court and becomes, then, a new decree before it becomes a sale.

2624 I referred in my testimony to one ditch at Cañon City that the State of Colorado had done something toward constructing or developing. There is one also at Montrose, from the Gunnison river, on which the governor expended twenty-five thousand dollars and which is the germ of the Gunnison tunnel, which is being taken up by the reclamation service. I don't know of any constitutional provision that would prevent the legislature from taking this work up and pursuing it. There is nothing impossible in it. A subsequent legislature might now take it up and pursue it.

As to the control of the water in the reservoirs, that varies. There was generally a proviso with each particular bill, that is, a bill appropriating money for construction. In one or two cases it provided that the water commissioner should turn that water out when needed; then there was another provision generally which said that the county commissioners should be entirely responsible
2625 for the dam and for keeping it in repair. In one of these reservoirs I think the water commissioner is to turn the water out when there is need for it. When he knows there is a lack of water in the river, that the supply in the river at that time is not sufficient for the needs of irrigation, this reservoir
2626 is simply to supplement that supply. The Twin Lakes reservoir is not a State reservoir. It is located on the south side of the Arkansas river, about eighteen miles southeast of Leadville, on Lake creek. It is something over one hundred and fifty miles up the river from the mouth of the canal that it supplies. When the company needs any water in its canal it turns the water into the bed of the river and takes that amount of water out at the head-gate of its canal, less a certain per cent. The law provides that the State engineer may fix that per cent. I think they have fixed it themselves. It is a matter that certainly has not come to the engineer's office. I think they have taken out ten per cent. for this loss by evaporation and seepage, or the loss be-
2627 tween the reservoir and the canal. The Twin Lakes reservoir supplies the Bob Creek canal, or, as it is also spoken of, the Colorado canal. They have found it practicable to store the water one hundred and fifty miles above the canal where it is used, but the other people along the river have objected very decidedly. Their objection is not to the principle but to the fact, or what they

think is the fact, that these people are taking water out that
2628 should go to them. I do not think that the method of storing water above the canal where the water is used is impossible or not feasible. It is in practice to quite an extent in this State. This can be repeated in the Arkansas valley just as many times as you have ditches and reservoirs and water to use. The reservoirs that supply the works at Pueblo are not all located near the canals or the place where the water is used, in fact the nearest one is three or four miles away and the farthest one is above Leadville one hundred and fifty or two hundred miles from
2829 Pueblo and not far from the Twin Lakes reservoir. This belongs to the Colorado Fuel and Iron Company.

Examining Defendant Colorado's Exhibit 23, I find it is incorrect as to the sources of the Smoky Hill river but correct as to the sources of the Republican river, which rises in Colorado. This map shows that in fact both the Smoky Hill and the Republican have their real sources in Colorado, and this is substantially correct.

Examination by Mr. CAMPBELL:

2830 By the "duty of water" is meant by engineers something analogous to a term that is used in other engineering, like the "duty of coal," the "duty of a steam engine," etc. It is in one sense the service that can be gotten out of water. It is expressed sometimes in different ways, but is generally used to mean the amount of land that is to be served by a given quantity of water, and that very frequently is a running quantity, like a cubic foot per second of time. If we take the duty of water as most commonly used we would speak of it as the amount of land supplied by the average flow during the irrigating season. Thus, if you had a cubic foot per second of time running for ninety days, or whatever the irrigating season might be, you would have
2631 a certain result if they were the constant size stream. If the stream should vary in size according to the needs of the crop, so that no water ran to waste, there would be more acres supplied by that amount. There you would have an average which would not necessarily indicate the exact amount being used at any particular time. The average during the irrigating season in Colorado, taking the average flow and comparing it with the acres, runs up to 150 acres or even more per second of time. Yes, there are some of the decrees that I have spoken of in the Arkansas valley in Colorado that are based upon a duty of a great deal less than 150 acres. A man farming in June has to use water at a greater rate than would be indicated by one hundred acres per cubic foot per second of time; that is, for one or two weeks he may have to use water or have it at his command so as to be able to use more at that particular time, and then the rest of the year the use would lessen, so that while the average might be 150, he might need it for a while at the

rate of seventy acres, and in order to have it when he needs
2632 it at that rate he usually attempts to retain the water so that he will have a cubic foot per second for sixty, seventy or eighty acres. That really represents in that case not his average amount of water that he uses but the maximum amount he can call for at any particular time. It does not mean that he uses it at that rate the rest of the year. Assuming that there are some decrees in the Arkansas valley that are based upon a duty of about twenty-five acres per cubic foot per second of time, most of that goes back into the river or he (the person who obtained the decree) don't get it. He does not assume to sell it to other parties. There have been a few cases in this State where the transfer of water has been made where, through ignorance or other causes, there has been an excessive decree and the owners of the water rights have thought they had an excess of water which they thought they could dispose of or have tried to when they thought the water might have a value. In the administration of water the officials are not to give water to the ditches more than is actually used. Some people who have
2633 decrees for excess water have in times past attempted to sell some of the extra water, if you may so call it. I do not know of any recent case of persons transferring their surface water, that is, the excess decree. There is a statute that provides a limitation in regard to leasing or renting water. The statute says for the immediate purpose of saving crops or the more economical use of water they may exchange or loan water one to another. The loaning of water has been treated somewhat differently in the different parts of the State. In some parts there has been almost none
2634 of it under any phase, and in some other portions of the State there has been some loaning, but it has been found to be abused and to affect the rights of others. It has gotten into the courts but has not been passed upon by our supreme court. It has been practiced to some extent in some places. I did not mean to give the idea that it had been general. No, in a case where A has a decree for one hundred cubic feet of water per second of time and he only needs fifty, and B has a subsequent appropriation to A, and C is subsequent to B, A cannot loan his surplus water under that decree to C, who is subsequent to B. Under the only order which has been issued under that, where it has come to the shape of an order, it has been said that A could not loan any water except such as he then was using and had occasion to use. In a case where A has a decree for one hundred cubic feet per second of time
2635 and only requires fifty it has been the practice to allow him to loan the excess to C, who is subsequent to B in appropriation. In that case it might be that A can use the water to the detriment of B by giving it C. Water has been recognized in this State as being independent of the land in some of the courts.

There are about 300,115 acres of irrigated land in the Ar-
2636 kansas valley in Colorado. I get these figures from the census report of 1902 on *immigration*. There are 4,557 farms and

795 irrigation systems, according to this census report. The acres and farms refer to the Arkansas valley and its tributaries. We
2637 have in the State engineer's office the number of the decreed ditches in the Arkansas valley and will furnish that to the stenographer later on. These decrees are in regard to the Arkansas river and its tributaries.

A very good duty of water is obtained in the Arkansas valley, but I do not mean to say that it is not capable of improvement. Irrigation is in a progressive stage. Every five or ten years we see a noticeable improvement and new means for saving are adopted
2638 and losses are prevented. The best results from irrigation, that is, the largest returns, can be obtained near the mountains, that is, so far as the mountain water is concerned. I say that from the fact that we have at that point a larger amount of water. The loss has not yet taken place, or a comparatively small amount of it, and hence there is a greater aggregate of water to be used so far as the amount coming from the mountains is concerned, and consequently, as I have always thought since I began to examine the question, it was a fortunate thing that irrigation began at the mountains. An additional reason is because of these losses which take place, and the consequent savings which can take place benefits the lower valley, and the ultimate result is that the lower valley is constantly being put under a better situation. It can ultimately be irrigated. If the water in the first place had to go a considerable distance from the mountains the losses which there result to the irrigation from those savings would apply to the land farther down and the land above this point could then never be benefitted in the future.

2639 I think I am acquainted with the character of the public lands undisposed of by the Government, as to whether they are arid or arable. On the plains they are nearly all both arable and arid; that is, there is no intrinsic reason why they cannot be ploughed, for instance, but they are dry. To get good results from these lands they need irrigation. The future development of this country is dependent upon the development of irrigation
2640 projects, because no agriculture, practically speaking, is possible for any of this western country without irrigation. Of course there could be range stock and stock raising of that kind, and there could be at times and in favorable places some agriculture. It would be precarious, however, and it would be, like other places on the earth's surface in such cases, subject to famines at any rate. The production, if there could be any without irrigation, would be small as well as precarious, and the country could not raise in that way even enough for its own consumption; in fact could scarcely raise anything. There could not be any successful agriculture, considering agriculture as the growing of crops.

I know that the average production of a square mile in the West, that is, irrigated lands, is a great deal more than that of a square

mile of arable land in the East, and the same applies as to an
2641 acre. The land on the plains not irrigated supports one person to a great many acres. Practically, it takes twenty acres to support a cow. This acreage has been a very frequent basis to figure on. Under irrigation there are some methods of irrigation which almost every irrigated section passes through as a stage where they use grass crops, like alfalfa, for instance, that a relatively small number of people are supported from at first. It then goes into more intensive agriculture—first into wheat, then into cantaloupes, small fruits, etc., and the tendency is constantly to subdivide and break up into small tracts, and in those cases where at the present time we see that development we find five and ten acres supporting
a family—and by family I mean there may be families
2642 of good size—and I think the limit has not been reached there by any means as yet. I am acquainted with what is known as the reclamation act passed by the Congress of the United States. I think I know the difference between the doctrine of riparian rights and what is known in this weste rn country as the doctrine of appropriation of water for beneficial purposes. If the riparian rights doctrine should be adopted in this wetsern country the reclamation act could not be carried out at all, because, as I understand that doctrine, the people along the river low down or elsewhere or persons owning land along the banks of
the river would be the only ones who would have any right
2643 to the water of the stream and they also would be entitled to and could claim the water to flow by them if they did not need it. In order to reclaim the land we have in the arid
2644 country it is necessary to take the water out of the streams.

I did not mean to say in my direct examination that the underground water in the Arkansas valley flows in subterranean streams. The underground water is flowing down hill, and for most of its course the water is flowing in laterally from the sides, the same as in an eastern stream. It is passing down, to some extent,
the channel of the river, because there is a bed of gravel
2645 underlying that whole country. As I understand, not long since a riparian owner could claim the privilege of having all the water pass him whether he wanted to use it or not, but I
think some of the decisions of some courts later have recog-
2646 nized that he must have some beneficial use of it. If the people of Colorado should be deprived of irrigating their lands no one could live here, practically. There would be some miners, and that would practically be all. Our industrial enterprises would have no customers and consequently practically everything would shut up.

Recross-examination.

By Mr. ASHBAUGH:

In northern Colorado the irrigating season is practically through the period from the middle of May to the middle of September. It is natural that it should vary somewhat with the crops; that is, wheat, for instance, would cease to need irrigation early in July, alfalfa by the first of September, and with the change in crops there is some change in the notions of the season. Fruits, for instance, need one irrigation at least late in the fall. Sugar beets or potatoes will take irrigation up to the first of September, and there is some tendency to make a little earlier irrigation. So that is somewhat elastic. The statute has said that the ditches that are carrying water under certain conditions must be prepared to carry water from April 15 to November 1. That is the nearest distinction I could give. That recognizes that while some crops may need water as early or as late as that it does not follow that the farmer
2647 looks upon that as his season for any particular crop. Some may be needed as early as the first of April and some late in November. In the southern part of the State irrigation sometimes takes place a little later or a little earlier, because it is milder. I do not recollect that the supreme court of this State has recognized the doctrine or custom of selling rights independently of the land, unless it is in the case of Strickler *vs.* Colorado Springs.

2648 Examination of Mr. CAMPBELL:

In answer to a question by the commissioner I stated that I thought the California courts had recognized riparian rights in the first place and then found that they simply could not apply them in an arid country as part of their State was. I do not know that I am clear as to what the modified riparian doctrine is, and I have never found anybody who did know. I do not know of any form that is generally recognized, and I have never in my experience met any lawyer or irrigator who could tell what the courts mean by the modified riparian rights doctrine. I do not see how there can be any development in the arid region by irrigation if the common law doctrine of riparian rights or any modified common law doctrine of riparian rights exists.

3649 The average flow of a cubic foot of water per second of time in the Arkansas valley ought to irrigate from 125 to 150 acres, I think, now. Under more favorable conditions it might run up to 175 or possibly 200 acres. I should not expect it to exceed the latter figures.

In extreme western Kansas they need water for irrigation. Water in the Arkansas valley through Kansas is just as great a necessity for the production of crops as it is in Colorado. Crops cannot be grown without water in any place that I know of.

2650 Redirect examination.

By Mr. DAWSON:

In answering the last question by Mr. Ashbaugh as to water being necessary for the production of crops along the Arkansas river in western Kansas, I meant water from any source. It may be dew or snow or rain. Simply that life is not possible without moisture. This is true as to the Arkansas valley as it is anywhere else. I did not mean to state that it was true that the waters of the Arkansas river as a river are as necessary for the growing of crops for the greater portion of Kansas through which it flows as they are for growing crops in Colorado.

In speaking of the average flow of a cubic foot of water serving one hundred and twenty-five acres of land and the possibility under certain conditions of its serving two hundred acres, I meant the average flow as heretofore defined by me, and that through-
2651 out the irrigating season a party would have an average flow of that amount of water for that amount of land. As a matter of fact the farmers along the Arkansas river and its tributaries in Colorado do have an average flow of that character. Sometimes they have less. They almost never have more than their decreed right, nor all the time have less. As explained before, the decree really is the maximum amount which they can get at any one time, not the average amount, and it is true that for the greater portion of the irrigating season most of them have less than the average amount. No, it is not true, as the water is actually used in the valley of the Arkansas river and its tributaries in Colorado under the decree rendered, that is is generally possible to irrigate 125 acres under a decree of one cubic foot per second of time. Yes, as the practice prevails and conditions exist, the amount of land that can be irrigated by a cubic foot of water per second of time,
2652 whether taken as an average or maximum, varies in different localities, according to the soil, the crops and the man. In the Arkansas valley in Colorado 125 acres cannot be irrigated with one cubic foot per second of time. Approximately from 50 to 60 acres and occasionally up to 80 acres can be irrigated from this amount of water. Counting the mountain drainage, the approximate average would be 60 to 70 acres. In a majority of the cases the use of water for irrigation in Colorado as a whole is reasonable and the lands are thereby made profitable. In many cases
2653 undoubtedly there is an excessive use of water.

As to my statement in the examination in chief concerning
2654 the underground waters along the Arkansas river, in my judgment those underground waters lying outside of the immediate bed of the river have no defined channel such as that used to designate a stream by. Those underground waters are simply oozing through the sand, mostly a fine sand, and of course going in the direction in which the surface water falls, but at an extremely slow rate. The underground waters travel from ten to fifteen feet

per day, but it is not in a channel. There are not those channels that you find, for instance, in a limestone country sometimes, where there may be underground streams, but every one is extremely minute—simply a kind of oozing water. I used the term "oozing" as practically synonymous with "percolating." In speaking of finding subterranean streams, there is no difference between a subterranean stream and a surface stream except that one is an un-
2655 derground stream and the other on top. (Objection.) The only reason why the term "stream" could be used in reference to this underground water in the valley of the Arkansas river is because of the fact that the valley has a slope parallel with the river and the water is passing that way to some extent. (Objection.)

In answering a question by counsel for the Government in reference to the production of irrigated land as compared with land in the humid region, I should think that the estimate that double the amount of crops could be raised would be low. I was there thinking of wheat. In other crops the increase is more than that. In this State and throughout the West as a whole agriculture has not been as skillful as it is becoming. Under irrigation there is an opportunity for skill to be shown in the production of crops, far more so than where the element of reliance upon certain rains
2656 comes in. In the valley of the Arkansas sugar beet raising, cantaloupe growing and fruit growing results in a much more productiveness per acre of lands in Colorado than in the Eastern or Middle States where the land is not under irrigation. (Objection.) Yes, I think it is true that where irrigation is practiced on a large scale as in the Arkansas valley evaporation takes place and the amount of moisture in the air is increased and the general humidity rises. Our observations have indicated that. It is true as a general proposition, and at Fort Collins the humidity is now very much more than it has been out on the plains. Formerly in Colorado, say along the Arkansas valley between Pueblo and the Kansas-Colorado State line, dews were practically never found, and they are now found there in the irrigated district. The prevail-
2657 ing winds along the Arkansas valley in Colorado are from west to east generally, or from west to southeast, or to the east or northeast.

No, I am not a licensed or practicing attorney at law, and in answering the question of counsel for the United States Government in reference to the loaning of water I took it up not so much as a question of law as a question of administration. As a matter of fact, from the information I have gained in the administration of water laws in Colorado the courts held, and the supreme court of this State has said that there must be read into every decree a limitation of the amount decreed to the amount that a man actually needs, and if a man had a decree for one hundred cubic feet
2658 per second of time and he only needed 50 cubic feet per second of time, in administering that decree I would not allow him to take one hundred cubic feet and waste the addi-

2659 tional fifty. As to the sale of water referred to by counsel for Kansas, the sale applies to the use of water. The water itself is not sold outright. And in administering the water laws of Colorado, if any given amount of water is sold, before a party can change the point of diversion or transfer it he must make an application in court and give notice to those who might be affected; and further, the party applying for such change must affirmatively establish that it can work no injury to anybody.

2660 In reference to the cross examination by Mr. Ashbaugh regarding the Hansen well and its distance from the bridge and the level of the water at the bridge and at this well, I will say that the well at the Hansen place was lower than the point at the river by four feet, I think. It had been previously shown in the direct examination that the water in that well was about nine feet higher than the river at the bridge. Now, the underground water would flow much the same as surface water. It will flow down the line of greatest slope and its speed is greater as the fall is greater. So if there be a flow from the point mentioned yesterday to the Hansen well, there would be a greater flow from that well toward the river, south. The whole region there slopes in a diagonal direction, somewhat southeasterly, and without having the facts of a great many other points at hand at present, yet those levels would agree with the fact that the maximum slope of that ground surface is somewhat southeasterly. The level of the water in the Hansen well was found to be about nine feet higher than the level of the water in the river at the bridge from which point the line of wells was started, and whatever may be the assumed elevation of the point taken by counsel for Kansas up the river, there will be a greater fall from that point to the level of the water at the bridge than from that point up the river to the level of the water in the well. Of course the level at the point in the river as taken yesterday was an as-

2661 sumption, but it makes no difference what the assumption is, if it is up the river it must be higher than down the river, and whatever the assumption may be, the water in the well being nine feet higher than the water in the river at the bridge, the fall would be greater towards the bridge than towards the well. That is, the fall from the assumed point up the river would be greater from that point to the bridge than from that point to the well, unless the river had a greater fall than was assumed. The fall from the river to the well would depend upon the distance you went up, and it would not make any difference at all what the fall of the river from that point to the bridge was, if the water was lower at the bridge than at the well. The fall from that assumed point to the bridge would be greater than from the assumed point to the well, because the well is higher. In other words, that water in flowing followed the greatest grade, other conditions being equal. The investigations with these lines of wells has not yet been completed. They

2662 are still being carried on. With the number of wells which have been sunk in the vicinity of the river through Kansas

it is not possible for one man to have charge of and make reports upon all of them and carry on all these observations within the time limited, nor is it possible that the gauges for the measurement of water in the river can be in charge of one man. At each place it requires a person who lives close by, because daily readings are made, and these are scattered over a distance of a number of hundred miles. I have myself taken readings on the same day and nearly at the same hour as those taken by the observers at the same points on the regular gauges, and of course have compared my readings with those taken by them, and have found them substantially correct in most cases when the river was at a permanent height. When the river was changing of course a difference of half an hour would make a difference in the reading. These investigations of the river and readings are still being carried on.

2663 You call my attention to pages 694 and 695 of the report of Willard D. Johnson. Here is a quotation on page 694 of the monograph by Willard D. Johnson on "The high plains and their utilization," in the Twenty-first Annual Report of the Survey, 1899–1900, part IV. This is next to the last paragraph on that page, 694:

"The high plains present a larger expanse of accessible and cultivable lands than this arid belt. To reach them across the latter would involve so much loss from seepage and evaporation that the area reclaimed would be much smaller than could be reclaimed close to the mountains, and an area in proportion to the whole insignificant. But the claims of the arid belt could not thus be wholly disregarded. Hence, even with complete storage and even under an equitable arrangement the high plains could expect to receive no appreciable benefit. It is very doubtful, however, whether complete storage will ever be found to be economically practicable. It may be accepted as certain that it will not in any case be undertaken for the reclamation of lands at a distance when lands are to be found close at hand which are reclaimable at less cost."

You call my attention to Document No. 90, report made to the 49th Congress, first session, from which I read yesterday on cross-examination, and you call my attention also to pages 7, 8 and 9,

2664 which is also from this Executive Document No. 90. It is entitled "Survey of the Arkansas river, from Fort Gibson to Wichita, Kansas," and includes a letter of transmission from the Chief of Engineers transmitting the report from the captain of engineers, including a report of Mr. Burroughs, assistant engineer. The captain of engineers was H. S. Taber. Mr. Burroughs was the assistant in charge of the survey line down the river. He states on page 7 of that report:

"The method of quartering and transporting the party was found to be in every way satisfactory after passing Arkansas City, but above that point, a distance of sixty-five miles, the river was found to be so shallow and full of bars as to make the moving of the boats consume more time than the actual work in the survey. In several

instances the party had to be withdrawn from the line for a day at a time in order to get the boats over shoals, and this in spite of the fact that they were only drawing some six or seven inches of water."

On page 9, which is under the sub-head "Wichita to the mouth of the Walnut creek,"—this Walnut creek being at Arkansas City:—

"At a number of places the greatest available depth found was from three to six inches. Our own experience in moving our own small quarter boats is a practical demonstration of the condition of this portion of the river during low water. In many instances it was only by means of the combined power of the whole party applied to poles and purchase blocks that they were worked over shoal places."

Then on page 8, in speaking of the river, is the following:

2665 "In the discussion of the river with reference to its general hydrographic features—that is, depth, oscillation, character of bed and banks, obstructions, both natural and artificial, and the general feasibility, desirability and probable cost of making successful navigation possible throughout the whole or a part of the river embraced in this survey—it should be borne in mind that no portion of it is at present or has ever been considered navigable. The mouth of Grand river is now considered the head of navigation, although, in fact, the commerce of the river for forty miles below this point is practically *nil*."

The mouth of the Grand river, as shown in Defendant Colorado's Exhibit 3, enters the Arkansas river in the Indian Territory. Walnut creek enters the Arkansas river at Arkansas City just below it. Yes, I find another tributary of the Arkansas river bearing the same name. There is a Walnut creek at Great Bend, Kansas.

You call my attention to the report from which I last read, at page 10, and the sentence at the beginning of the next to the last paragraph on the page, and you ask me to read it. This is from Mr. Burroughs' report or part of it. It reads as follows:

"The citizens have long since recognized the impracticability of ever making this part of the river an artery of trade, and have therefore not hesitated to obstruct it with bridges and dams. The railroads built and projected will easily solve the problem of transportation without the river being considered as a factor."

2666 Yes, I was asked yesterday by counsel for Kansas to read from the work of Edward Everett Hale entitled "Kansas and Nebraska," and I read a sentence appearing on page 115, and at your request I now read the sentence immediately preceding the one which I then read, following it by a re-reading of the sentence read yesterday. The whole paragraph reads as follows:

"The droughts described render the Arkansas river a very uncertain reliance for communication. It is said, however, that a steam boat can ascend at full water within twenty-four miles of the Great Bend—the point where the river gains its greatest northern latitude."

The second sentence is the one read yesterday, forming the last

part of the paragraph. As to the navigation of the Arkansas river, it would not be possible for any boat to make headway against the stream in the Arkansas river as it gets very near to the mountains, because it becomes a torrent.

Q. Would that or would it not be practically true from the time we pass the Colorado State line in times when there was sufficient water in the river for any boat to travel?

2667

A. When there is sufficient water in the river—which is only at times of flood—then the current is exceedingly swift.

In my examination in chief I was asked by the commissioner if seepage and drainage were one and the same and answered then "By extension, yes." I meant by that that the waters which appeared in drains in the East and which I was used to hearing called "drainage water" was the water which ran through the saturated soil, and which, of course, is the case with seepage water. I did not mean by drainage there that the term should apply to the surface water at all but simply to the sub-surface water or underground water that is collected in drains or that might be collected in drains. In that answer I had in mind in the one instance the water which is collected from a saturated soil and drained off and in the other the water which is produced by a saturated soil by reason of irrigation and runs off. The irrigation of land often produces a condition of saturation of the soil similar to that which you find in lands in a country where there is a great deal of rainfall but no irrigation. (Objection.)

Recross-examination.

By Mr. ASHBAUGH:

6668 When in reply to a question by counsel for Colorado I stated that the fall of the river toward the bridge mentioned in the Colwich measurements is greater than toward the well, I meant the total amount of the fall at least, and the slope is also greater. The fall would be greater because the distance is greater. Well, not because the distance is greater. The total amount, of course, would be the difference between two specific heights. That would be irrespective of the distance, but the rate, of course, would depend on the distance. The total amount of fall would be greater simply because the elevation is greater at one place than at the other. I do not recall and do not know that the distance is greater in the one place than the other. It is a fact that the river at the upper place is higher than it is at the lower place, no matter

2669 what the distance is, and the farther you go down the greater the total amount of fall would be.

2670 Executive Document No. 90, from which I noted, refers to the part of the Arkansas river upon which the Government had made some appropriations, but to what extent for that portion of the river I do not remember. These appropriations were expended

from Wichita down the river to Fort Smith, wherever the en-
2671 gineers saw fit. The appropriations were specifically made between Fort Smith and Wichita, and most of the money was spent down toward the lower end. That is my recollection. These appropriations were made upon that part of the river the upper portion of which is at Wichita, Kansas.

Redirect-examination.

By Mr. DAWSON:

Q. In running these lines of wells from the river were you able to run them at right angles with the river at all places, and if not why not?

A. They were not run at right angles at the places north of Wichita—that is, Mount Hope and Colwich—because it was practically necessary to follow the lines of road, which do not run at right angles to the river.

Q. Had you not followed the roads you would have had to trespass or go upon lands of private individuals?

A. Yes, sir.

Recross-examination.

By Mr. ASHBAUGH:

I don't know of any case in that vicinity where they went on the lands of private individuals to make measurements. I do not recall any such place in Sedgwick county. The observers were instructed to follow the lines of the road, and I do not recall any case where that was not done. I would not state beyond that that it was not done.

2673 EDWARD L. BERTHOUD, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I reside in Golden, Colorado, and have resided within the State of Colorado forty-four years last April. I am nearly seventy-seven years old, and am a civil engineer by occupation, having followed it more or less since 1849. I followed that profession in New York, Pennsylvania, New Jersey, South America, the West Indies, Indiana, Wisconsin, Kansas, Wyoming, Montana and Utah. I lived
2674 in the State of Kansas for five years, beginning with 1855, to 1860, at Fort Leavenworth and Leavenworth. I was in the United States Army twice. I served a while in 1855 in the Kansas troubles and then again from 1862 to October 19, 1865, in the United States Army. In 1862 I was appointed in the fall adjutant of the 2nd Colorado Infantry. In the spring of 1863 I was

ordered to Fort Leavenworth and appointed post adjutant for Fort Leavenworth, Kansas, and assistant adjutant general of the troops in charge of the Santa Fe road from Council Grove to the Raton mountains. When I speak of the Santa Fe road I allude to the road that was used for the transportation of troops and goods from the Missouri river to Santa Fe and the posts in the West along the Arkansas river.

My duties as an officer of the United States Army took me along the Arkansas river during the year 1863. I was along the Arkansas river, I might say, from near Pueblo or below Pueblo sixteen miles to a point about ten miles below Walnut creek in Kansas,
2675 and south of the river bed, crossing and recrossing it at various places. Walnut creek is a branch that runs into the Arkansas river about three miles below Fort Larned. Once or twice that year I had to go to Fort Riley on orders and back again, and otherwise I would go out with scounting parties or would go out on the river up and down with the quartermaster. I had a squad of men with me at times, not exactly under my command, but I was representing the command of the district, making notes and giving directions as they were giving to me. I had general supervision of the whole thing, officers as well as men, and accompanied the scouting parties up and down the Arkansas river and south.

I had been stationed at Fort Lyon from the end of January to the end of April, 1863. That is right on the banks of the Arkansas river about 65 miles below Pueblo, and in the end of April I was ordered down to Fort Larned and followed the river down to
2676 the post. I was stationed there. Starting from the end of June and into July there was scarcely any water in the Arkansas river at all, and at the end of July and in August we crossed the river dry shod. There was no water in it at all. We crossed it near Walnut creek, at the mouth of Pawnee Fork, and up above about ten miles above Dodge. Near Fort Dodge, or where Fort Dodge is now, we crossed the river and there was no water. I was along the river from the mouth of Walnut creek to Fort Lyon in Colorado in June and there was some water running then, but at the end of July there was none. About the 15th or 20th of June I saw the river at Walnut creek and Pawnee Fork. There was
2677 some water running in it then. The water was pretty low already then. I should think there was not more than half of what there would be at other periods of high water, and not hardly that, even. I know it was so low that we sent men out south of the river and they forded just above the mouth of Pawnee Fork and paid no attention to the water. They just rode right through without any halting or any stopping at all. There was not over a foot or a foot and a half at the deepest place. That was at the end of June. I didn't follow the river up at that time but came back to Fort Larned. Afterwards, in July, I went up the river with a scouting party. We went up to a creek called Coon creek at that time to see what the Indians were doing or whether

there was any camp up there, and the water was very scarce. We had to dig in the bed of the river to get water for the horses and men. Then we came back. I should judge we went about forty miles up the river from Fort Larned. There was no water running in the river at all where we stopped. There were pools of water here and there, but no running water. We crossed over the river again in August still farther up, and then we went down
2678 scouting on the borders of Texas near the Wichita mountains. There was no water in the river at all except in little holes here and there and little creek beds coming in from the south. The place where we crossed the Arkansas river at that time must have been at least forty-five miles above Fort Larned. There we crossed with a wagon and about twenty-five men, most of them mounted, and about fifteen or twenty Indians. There was no water running there at all except a little that came out of that creek, enough to water stock, on the south side of the river. That was the only water we saw at that time. There was not a bit of water running in the river. We camped right on the bank there. That was in the beginning of August, and I was there one day and two nights, and then we went on south.

After that I was often up on the river, so often that I couldn't specify the times. I was down to the river probably every week, or down to the bank. We went down there to hunt buffalo once or twice, and crossed the river. We went down toward Walnut creek, and then we sent a scouting party down below Walnut creek and they came back and said they found no water at all. This was such a dry summer that Pawnee fork didn't run at that time and all the water we had from Fort Larned was from two wells and ponds above made by the beavers, and all the animals of the country came to the Pawnee fork and around that fork to get water. There was no water anywhere else.

2679 About the first of November I got an order to go to Fort Lyon. I went up there with a couple of men and an ambulance and stayed there probably three or four days. After I started back, I think it was the first night out, we camped on the bank of the Arkansas river with very much bother—we couldn't get any water. We finally found a little hole where there had been some melted snow, and we got enough to make a cup of coffee and water the horses. There was not a drop of water there. There was some Indians around there, and they were on an island getting water. And then we came home. The next morning we kept on going down the river going eastward, and I don't remember whether we got a drop of water that day or not. I rather think we didn't get anything until evening, and very little at that. So our
2680 stock were in bad shape. But we kept on. We stayed there—I think the driver found some water. We bought a canteen then, and I don't remember whether the mules got water that night or not. Next day we started out and drove in a snow storm all the way to Fort Larned, about eighty-five miles. We

found no more water in the river. We took melted snow. We found snow there. The river was entirely dry from the boundary of Colorado down to Fort Larned at that time. The men had been out down below and some of them said that probably two hundred and fifty miles of the river was entirely dry. There was no water excepting by digging for it. This was in 1863. On this trip going down the river we followed the banks of the river all the way down.

That was the only chance of getting grass or getting water.
2681 We just got enough water to keep body and soul together.

One place where we stopped, as I said, we found a small water hole that the Indians had been using. There were Indians camped on an island in the Arkansas river, and we got enough water there to make a cup of coffee and water the horses. The next night, as I say, the driver found some water for the stock, and brought in some in the canteen. As for digging water for the stock, there was none to get. When we were on the prairie there was none, and when we were on the bottom again there was none at all. We didn't pretend to look for it. You couldn't find any. There was no water in sight at all in the bed of the river. You could cross over anywhere dry shod at that time.

To go back a little bit and describe the condition of the river a little more in detail, I went down the river about the first of May. The river was at a fair stage then. It was not over the banks at all, but pretty nearly level with the banks, and it was that way until we got to Larned. At the beginning of June there was water in the river. It was falling then pretty rapidly. It got down in June and in July there was scarcely any water at all. From July, so
2682 far as I know, it was dry on to November up and down from Fort Lyon to Larned.

The next time I saw the river was about May 1st, 1865, at the mouth of Walnut creek. I saw it several times during that year after that, west up the river as far as where Dodge City now is. That is as far as I went up the river that summer. The river was pretty low that year. There was water running.

I next saw the river in 1869. I meandered the Arkansas river for the United States Government from Pueblo east about fifty miles. I think the exact length of the line was forty-two miles, but I had to go a little beyond that. The water was pretty low. We
2683 crossed it several times dry shod. That was in the winter from about the first of February until about the end of March.

Cross-examination.

By Mr. ASHBAUGH:

After 1869 I was by the river half a dozen times. There was water at La Junta and there was water at Pueblo. I was not down there looking for water. I saw the river below La Junta after 1869.

I passed up there in a car in the night, but I couldn't see
2684 anything about it. I paid no attention to it at all. In May, 1863, there was water in the river, of course, coming down. There was no high water then, though. The water appeared to come from the west coming from the upper sources of the river, from the Huerfano, from the Purgatoire, from the Fountain and from the Chico and other streams—the San Carlos and a number of others—Two Buttes creek. In going down the river in the month of May I didn't try to ford it. I had do occasion to do so. Going to
2685 Fort Larned the road was on the north side of the river.

Q. Well, when you dug in the river bed for water you got better water than where you could find it in the pools did you not?

A. Oh, yes, when it was running, the water was pretty good. It was rather muddy at times, and sandy.

Q. But even when there was water in the pools in the river you would prefer to dig and get water in that way because it was better water, was it not?

A. Well, passable. If you had to dig any the water looked like coffee color. It didn't seem very good.

Q. But it was better than the water lying in the river bed in the pools, was it not?

A. When we dug down?

Q. Yes.

A. No, it was not, nor as good.

Q. It was not as good?

A. No, it was not.

Q. So that if water lay in a pool all day in the sun——

A. Well, it would be warm, but clear, if it was not full of dead fish.

Q. Well, now, when you would go and dig in the sand in the river would you not get clear water?

A. You would get cooler water, but a good deal of it seemed to be alkali water, a good deal of alkali in it. It had a dark color, too, frequently.

Q. Did you ever see the river when it had no water in it at other times than you have spoken of?

A. Besides 1863?

Q. Yes.

A. No, sir, I never seen it dry since that time.

Q. You spoke about dead fish. Did you find dead fish in those pools?

2686 A. Yes, some pools had alligator gars in them, and there was some others.

2687 DEANE MONAHAN, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I have resided in Denver over ten years. I am a retired army officer and have been connected with the United States Army since July, 1856. I served through the Civil War as an enlisted man, corporal, sergeant and 2nd lieutenant. I was sixty-eight years of age on the 14th of last November. I was captain at the time I retired, and have recently been promoted to the rank of major by act of Congress.

In 1861 I was a corporal in the army and my duties in that position brought me into the State of Kansas in that year.

2688 I crossed the Arkansas river in the State of Kansas twice during that year, once travelling east from New Mexico and again in returning to New Mexico from the East. Travelling eastward I think I crossed in the month of June that year at what was known as the Cimarron crossing. It was on the Santa Fe trail going from New Mexico. That point was eastward from Las Animas about fifty or sixty miles. It is within the present exterior boundaries of the State of Colorado I think, near the State

2689 line. On my return I crossed the river at the same point. We were camped on the river from the Great Bend of the Arkansas to the crossing place. I think we camped on the bank of the river. The Great Bend I have spoken of is at the point marked Great Bend on the map identified as Defendant Colorado's Exhibit 3. It is near the present site of Great Bend in Kansas. We marched down the river in the month of June from the Cimarron crossing to Great Bend and returned in August. I travelled along the river between those points several days marching, going

2690 and returning. In going in the month of June, that is, going down the river, the river was fordable; it was low. There was water at all points in it where I saw it. There was water running through the bed of the river at all points where I have seen it, probably in some places twenty-five or thirty yards wide where the stream was narrow and spreading out at other points to a much greater width. That was when I went eastward. The water varied in depth perhaps from a foot to eighteen inches. I don't

2691 think there was more than that unless at some of the deeper holes. As I travelled eastward I think it was a little lower where I left the river or near that point than where I first struck it. There was not quite so much water in it. When I passed up the river in the month of August there was no running water at that time at all. The stream was dry, with occasional water holes in the bed of the stream, but no running water whatever. I crossed the river every day during the time I travelled along it. I hunted along the stream. I was very fond of hunting and had no partic-

lar duties at that time, and I hunted each day and crossed the river at least twice every day, and my testimony refers to the entire distance during that period.

I next saw the river in 1862. My regiment was then going from New Mexico to Tennessee. We crossed the Arkansas river I think at Fort Lyon; that is near where Las Animas, Colorado, is now located. I think that was September or early in October.

2692 There was considerable water in the river at that point at that time, probably two feet at our crossing. During that trip I didn't cross the river as I had before, because I was engaged with the troops, and my evidence refers just to the crossing—to the ford.

I was along the river again in 1866. I was under orders

2693 at that time. I was going to Fort Stanton, my station. I had ample opportunity to visit the Arkansas river all the time I travelled along it. I was quartermaster for the command that I travelled with at that time. On leaving Fort Riley in Kansas there was a Russian pri-ce who was coming westward to hunt in that locality, and the commanding officer had orders to afford him every facility to enable him to hunt coming out, and I being quartermaster, and very fond of hunting, accompanied him daily on those hunts while he was out. I crossed the river every day during that time at least twice. The river was then very low, so that you would find only a little trickling stream occasionally, and again there would be no water running but water holes all along. It was almost dry. The sand was wet, but there was very little running water—a little small stream here and there. You could wade through

2694 them without the water coming over the top of the shoe anywhere. That same condition existed all the way up to Fort Lyon during that trip. There was a little more water perhaps toward Fort Lyon as we went up the stream than where we first struck it; that is, it appeared to increase as we travelled up the river. On that trip I passed over the same ground that I did in 1861, from Great Bend to Fort Lyon. I think perhaps it was in the latter part of October. The trip took about ten days, to the best of my belief. There were holes along the river bed during that trip where we found ample water for our stock. We always found

2695 holes where we could find sufficient water for the stock. If not enough in one hole we could scatter the stock along and water them in different holes.

Cross-examination.

By Mr. ASHBAUGH:

I crossed the river again in 1869, early in the year, at Fort Lyon. I think it was in January. There was a stream of water. I remember we forded it. The water was perhaps eighteen inches to two feet deep where we forded it at Fort Lyon. By being fordable I mean that we had no trouble in crossing it with wagons or horses.

I may have been mistaken as to the distance the Cimarron
2696 crossing was from Fort Lyon, not as to its location. It was where old Fort Aubrey was located formerly. There was to trace of it there at the time I first crossed in 1856. The town of Cimarron in Kansas has no relation at all to this crossing. It was further west. This Cimarron crossing was named from an old dry river bed that ran into New Mexico. The Cimarron crossing was a branch of the Santa Fe trail that ran down and crossed the Cimarron river and got its name because of the Cimarron river and not because of any town on the Arkansas. I didn't see the river
2697 at any other times in the years 1861, 1862 or 1863 than the ones I have spoken of.

I never saw the river during the months of May or June when there was any running water in it, that I recall. I think I didn't cross the river at any point in Kansas in the year 1869. That was the year I went in on leave in January and February, I think, and I don't think I saw it at that time. I have heard the name of the Russian prince that I spoke of, but I don't think it was the Grand Duke Alexis.

2698 WILLIAM R. BEATTY, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I reside in Denver, Colorado, and am sixty-six years of age. I am a book-keeper by occupation. I have resided in Denver about forty-four years. I was on the Arkansas river in the State of Kansas or in the eastern part of the State of Colorado most of the summer of 1863, in fact during all of that year. I was a member of Com-
2699 pany F., 1st Colorado Calvary, stationed at Fort Lyon. We were recruited in Denver and first went from here on horseback to Fort Lyon and then from there to New Mexico and back again to Fort Lyon. On that trip going south we struck the river, I think, about ten miles below Pueblo; then we followed the river to Fort Lyon. On that first trip we didn't go east of Fort Lyon farther than a few miles below. I think that was early in the spring of 1862.

I next saw the river coming from New Mexico to Fort Lyon during the winter of 1862–3. I think we struck the river at Bent's Old fort, forty or fifty miles below Pueblo. We went down to Fort Lyon along the river and were there the balance of the winter until in the spring of the year. On account of Indian troubles the company I belonged to and a section of the Wisconsin battery was
2700 ordered to old Cimarron crossing, somewhere near a hundred miles below Fort Lyon. We were there during most of the summer of 1863. We were sent there to protect the trains and stages. We camped on the north side of the river. I was up and

down the river more or less during the time, probably thirty or forty miles below the Cimarron crossing, and I think I made two trips to Fort Lyon during the time. To the best of my recollection, Cimarron crossing was about one hundred miles below Fort Lyon and I think was within the exterior boundaries of the State of Colorado. I left the Arkansas river, I think, somewhere near the last of September or first of October in 1863. We then came to Fort Lyon, went down to Fort Union, New Mexico, probably stayed there
2701 a week and then back to Fort Lyon. I was at Fort Lyon all of the winter of 1863–4.

When I first saw the Arkansas river in 1862 there was running water all the time down to Fort Lyon and some miles below. It was generally, with few exceptions, fordable with a horse. My recollection is that once or twice there was quite a freshet or flood. I think at one time the rise in the river lasted from two to three weeks. For two or three weeks it was a little hard to get across the river. It was a little dangerous to cross it on horseback. In 1863 when we came there there was running water constantly at Fort Lyon probably one or two feet deep. It would vary as you crossed. It was about thirty or forty rods wide, according to my recollection. In 1863 when we left Fort Lyon to go to Cimarron crossing there was a good, fair stream at Fort Lyon. As we went down the river it got less. When we got about fifty or sixty
2702 miles, to the limit of the timber, from there down there was no running water in the river at all. All the time I was at Cimarron crossing there was no running water in the river. It was perfectly dry as a general thing. It was perfectly dry at a point sixty miles below Fort Lyon, and that was the condition that entire season of 1863 while I was there. The river was perfectly dry from the time I got to Cimarron crossing the first time until I left it the last time—no running water at all. (Objection.) My recollection is that we got down there some time toward the latter part of June, and I think that was near the latter part of September or a little later when we left. As to getting water for the camp, and for the stock, on the south side of the river probably half or three quarters of a mile above our camp was a depression in the river which had standing water in it all the time, where we watered our stock. For camping purposes we had holes dug in the sand. You could reach over and take a bucket and dip about one tin full of water and go to another hole and fill your bucket. As a general thing, below that point we got the water in the same way, by digging in the sand in the bed of the river. We could always get a little water.
2703 To the best of my recollection the only irrigation ditch at that time taking water from the Arkansas river between Pueblo and Cimarron crossing was at what was called the Boone ranch, about eight to twelve miles below Pueblo. As to the size of that ditch, in going into the Boone farm you could easily step across it. Probably if it was full it would hold a foot to a foot and a half of water—possibly two feet.

Cross-examination.

By Mr. ASHBAUGH:

This is the only Cimarron crossing that I have any knowledge of on the Arkansas river. It is my impression it was within the State of Colorado. My understanding was that it was a crossing of the river to avoid the main crossing in the Raton mountains that went over the country to the Cimarron river, and to avoid the main part of the Raton mountains. There may have been another Cimarron crossing away down the river near Fort Dodge, the trail from which finally met this trail, but not to my knowledge. In my reference to Cimarron crossing I do not mean the Cimarron crossing near Dodge City. In my observations along the river in 1863 I was nearly thirty or forty miles below this Cimarron crossing that I have described once or twice. My impression was that we were very nearly into Kansas, if not in Kansas. That was my impression at the time.

2705 HARRIS A. NEWTON, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I have resided in Denver about ten years, the last time. I keep a jewelry store, and am fifty-four years old. I was familar with the Arkansas river from Las Animas clear to Great Bend, Kansas, in 1879. I drove a herd of sheep down along the river that year. My brother, George Newton, who resides at Debeque, Colo-
2706 rado, and his wife, were with me at the time. We had sixteen hundred head of sheep with us. We bought part of them in New Mexico and the balance in Las Animas. We left Las Animas about the middle of August and drove them to Emporia, Kansas. We drove them about eight to thirteen miles a day. From Las Animas down by Fort Lyon and Granada and down to the Kansas line or a little below, say about Holly, we seemed to get plenty of water in the river most any place to water them. From there on we had trouble about water. By nine or ten o'clock in the morning we turned in on the river with the sheep, driving them down in the river bed on the sand until we found water. There was just a little running water in places. In the rest of the places it was dry. I remember one day we had no water for the sheep. We couldn't find any water. After nine or ten o'clock in the morning we drove all day in the river bed. I remember we found water next day somewhere. When you drive sheep they ought to
2707 have water every day. We couldn't find water even in holes on one day, but there was only one day on the trip when we had no water for the sheep. We would generally find a little running water. The bed of the river was all dry. It was a little damp sometimes, but just a bed of sand. All dry sand and no water in

the holes and no running water. We probably took, to make that trip, three or four weeks from Las Animas to Great bend, arriving at Great Bend some time in the latter part of September. When we got to Dodge City there was a bend in the Arkansas river below there and we took the route that went along by the railroad, by Spearville, and then struck the river maybe twenty or thirty miles below Dodge. It was dry along there more or less clear down to Great Bend. From Coolidge to Dodge City was the driest part of the river, through by Lakin and Garden City and along
2708 there. It was dry the whole distance except in places where we found some running water. There might be several little streams. It might run for half a mile or a mile and then it sank back again. As the prairie man says, it rises in the river a little and then sinks again. I didn't see the river again that year. We left the river at Great Bend. We came back in the spring of 1880 with a team and travelled thirty or forty miles a day, and we didn't need any water only for our horses. We found enough for them. We didn't pay any attention to the river coming back; we travelled too fast.

Cross-examination.

By Mr. ASHBAUGH:

I was not along the river in the spring of 1879. There was water in the river where we saw it in the spring of 1880. We came
2709 back in April, 1880. My observation along the river when we had the sheep there was from some time in the latter part of August until the latter part of September, 1879. I crossed the river below Great Bend in 1872. There was water in it then, and we swam cattle over it there. This I think was the first week in June, 1872. We crossed the river there about five or six miles below the mouth of the Walnut. We had about twenty-two hundred head of cattle. Yes, we had to swim them across the river. I remember there was a short distance there that we swam
2710 them. I had to swim the horse to get over. We were going to Ellsworth, going north. We came up the old Chisholm trail. This was the fore part of June. I had gone down to Texas in February. In going down I crossed the river on a ferry in the Indian Territory. I crossed the river two years later, in 1874, at Great Bend. We had cattle then. There was not much water in the river at that time. That was about the first of September or latter part of August. There was just a little water—five or six inches deep. It was shoe deep—water enough for the cattle—and it might have been thirty or forty yards wide. At that
2711 time we had about 2800 head of cattle. These cattle we brought up to Colorado.

In 1872 and 1874 are the only times that I saw the river in Kansas in respect to my cattle business. In 1874 we crossed at Great Bend and came up the Walnut and then turned north and

followed up the Smoky Hill. At that time of the year there was not very much water in the Smoky Hill. There was run-
2712 ning water in most places, not in every place. During the early '70's I didn't see the Arkansas river in the State of Kansas at any other time or place than I have mentioned.

Redirect examination.

By Mr. HAYT:

I crossed the Arkansas river in 1872, I think, about five or six miles below the mouth of the Walnut, at Ellinwood. I don't remember how the Walnut was at that time, and I couldn't say whether any of the water in the Arkansas river was coming from the Walnut or not. I think we crossed below it. We crossed it in an hour or two and went right on north.

2714 ROBERT ROBERTS, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I am sixty-eight years of age and have resided at Denver, Colorado, about ten or twelve years. I have been around there for twenty seven years, I guess. I used to be in the stock business. I don't do much of anything lately.

I was along the Arkansas river in 1871 and was located at that time at Emporia, Kansas. I was a stone mason at that time. I was sent over to the Arkansas river by a party to see about getting some rock and to look over the country to see if I could get some rock. That was somewhere in the neighborhood of November or October, 1871. I struck the river on that trip not far from where the
2715 Santa Fe trail came to it, across from Newton, in there. I should think that would be somewhere around Hutchinson. I should think Hutchinson would be the nearest place. Of course there were no cities there then. At that time I was at and about the river perhaps a week more or less. I went up and down the river from that point maybe six or eight miles; then I went out in the country some. I couldn't say there was any flow of water in the river at all when I saw it. There didn't seem to be hardly any on top. There were pools here and there, but I couldn't say that I saw any running water at all. I didn't see it running very much anyhow. It was in pools. I saw quite a lot of holes. Hardly
2716 any little runs from one little pool to another. I crossed the river at that time on foot and didn't take off my shoes nor get my feet wet. I crossed it dry shod. We had to go to one place and we had to go a little higher up. That was the first time I ever saw the Arkansas river in that country. I saw it again in 1872, either in March or April, about Larned. The first place I stopped

was maybe between Larned and what they called the Big Bend. There was considerable water in the river at that time. It was not very high, though. The water was in a kind of two streaks. There was one on this side and one on the other side. The one next to the side we were on was maybe ten or fifteen yards wide and about a foot or eighteen inches deep, I should judge. The other stream was small, and there was sand between these two streams. I was
2717 not up at that point very long at that time. I was laying stone.

I next saw the river in 1872 about Dodge City, right between where Dodge City is now and the fort. We camped right on the bank there. I think that was in May. I was laying stone there also. The river had quite a good deal of water in it there at that time. That was in two streams also. The heavier body of water ran on the side next to where we were—next to Dodge City.
2718 There was quite a stream there. It was perhaps a little deeper than a foot and maybe twenty yards wide in one place. I never went so much on the other side, but I could see it. It looked like a small stream. There was quite a sand bank between the two streams.

I think the next time I saw the river was some time in the latter part of July, about between thirty and forty miles up. The river was smaller.

The next place where we were on the river was right near where the State line between Kansas and Colorado is. The water was very small then. It was still getting smaller and we had to sink barrels to get water for our camp. We couldn't get enough water in the river. There was a little water there, but we had to sink barrels in the sand in the bed of the river so that we could
2719 get it. I stayed there until pretty near Christmas. It seemed as though the water was getting less all the time. There was no running stream at that time near the State line that I could see from the time I went there until I left. I know the boys took the mules over the other side to water them in a hole.

Cross-examination.

By Mr. ASHBAUGH:

We started from Emporia in 1871 and passed through Cot-
2720 tonwood Falls and Peabody. Newton was not started at all. From Newton we crossed the Little Arkansas river. There was quite a little bit of water in it. I should think it may have been nearly thirty feet wide and six or eight inches deep. The town of Hutchinson was not then started. There may have been a few camping around there. I didn't cross the river near where
2721 Hutchinson is now located. I believe we did cross the river one day about six miles above. I crossed the river up above the next year. I didn't cross the river in 1871. We were away in the middle of it anyway one day. But in November, 1871, I didn't

cross it to the other side, but went far enough to see the
2722 banks on the other side. We were afoot then. We went down into the bed of the river, but didn't go across. We were going from one point to another. There were no trees in the
2723 bed of the river. There was some drift wood, etc., however. There were no trees growing on any of the sand bars, no willows, no cottonwoods and nothing of that kind. There were sand bars in the bed of the river. I didn't measure them. There were some places lower than others, of course, where there was sand in the water. I guess I am sure this was the Arkansas river. I crossed Cow creek afterwards; I didn't at that time. I never saw any water in Cow creek. I crossed Cow creek—I had to cross it. The bed of Cow creek was quite wide too. Maybe a hundred feet or more. I don't know. The bed of Cow creek is not quite so wide as
2724 the bed of the Arkansas. Pretty wide though. I should think a hundred feet. It seems like where we crossed Cow creek the banks were a little deeper than the banks of the Arkansas, maybe five or six feet where I crossed it. I was down there about a week, I guess, and then went back to Emporia. There were no towns built west of there. They were building a railroad
2725 there, you know. I went back the same way I came, through Newton. There was not much Newton there. I stayed the winter of 1871 and 1872 in Emporia. I crossed the Little Arkansas on the cars in the spring of 1872. I crossed Cow creek in the spring of 1872, but I don't remember whether there was any water in it then. There was water in the Arkansas then. I couldn't tell you how deep at that point. I never went down to the river. The railroad then came up not very far from Larned, but I am satis-
2726 fied that we came up as far as Great Bend in the spring of 1872. I know the railroad was built as far as Great Bend in the spring of 1872. I saw the river at Larned that spring, but I couldn't tell you exactly how deep it was. There was plenty of water in it, but not from bank to bank. The banks were in some places pretty wide there, but I don't know how wide. Maybe they are in some places half a mile wide. The water was in little
2727 places. I couldn't tell how wide it was. In May or June, 1872, I was near where Dodge City now is. Well, the river was in two kinds of streaks there, one on the other side of the river and another on this side. I came up the river that summer to the State line, until the road stopped. It took all summer and pretty near to Christmas. There was no time during the year 1872 that the river was very dry. I guess there was some time when it was three or four feet deep. I think it was. That is, not all over the bed of the river. It was three or four feet deep a very short time. I couldn't tell. It was not very long. It was getting down and down all the time. It got up at one time, of course. That high water didn't last very long; it went down
2728 very quickly. It wouldn't be any more than a week anyhow. I couldn't tell how long it lasted. I don't think it rained

along the river in the summer of 1872 all summer to amount to anything. I don't know whether it rained above or not. It didn't rain where we were to amount to much. It was very dry. It was a very dry summer. During the summer of 1872 the river never got any height at all. That was the highest, when a little freshet came down. It didn't come up practically as high as the banks, not near. The banks at Dodge are three or four feet high, I should think. They are low banks. I didn't cross any other streams that had water in them. I don't remember, when I crossed Walnut creek, just below Great Bend, whether there was any water in it or not. If I crossed it I crossed it on the railroad. You
2729 see our work started this side of there. The railroad went up to the State line in 1872. I was working on the grade on the railroad in 1872, up to Coolidge, along from place to place. I should think they ran construction trains up to Coolidge in 1871 which were carrying passengers. They called the town at the State line Sergeant then. I think Coolidge is the same place. I don't think they were running any trains that way when we left, but the construction trains were working, and then we came down, and if I remember right we came down on box cars or flat cars or something for quite a ways and then we got a regular car.
2730 It was either in May or June that the water was highest in that year.

2731 WILLIAM A. PERRY, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I have resided in Colorado for twenty-one years. I was on the Arkansas river in Kansas in 1870 for a short time. I was camped probably eight miles above Wichita, for two or three weeks, in that vicinity. I went to that place thinking of locating a claim
2732 for a homestead. During the time I was there I was prospecting the country, driving around from place to place. I was at Wichita at the time. It was quite a small place. I don't know what the population was. I didn't see the river right at Wichita, but I saw it above Wichita, from a point seven miles above to twenty-five or thirty miles above Wichita. There was very little running water in the river at that time. There seemed to be some pools or depressions in the river bed that were full of water, but very little running water. It was in small, narrow streams like. There would be a strip of water and a strip of sand, and there would possibly be more water there in the morning than in the evening. In the cool evening the water would rise more, but I don't think it was over five or six inches deep that I saw the running water there. That was the condition all the way along the distance that I saw it.

2733 I noticed the Little Arkansas river at that time about five to seven miles above Wichita. I crossed the river. There was more water in the Little river than in the Big Arkansas, as I remember it. This was in the fall of 1870, probably in October. I didn't see the Big Arkansas river below its junction with the Little Arkansas. I crossed the Big Arkansas river from time to time in a wagon, and I noticed the condition of it. I don't know as there was anything in particular that caused me to notice its condition with reference to the water, but we were remarking it was very little water to be called a river. Where I had been raised there was a great deal more water in the rivers. It was a matter of surprise to me to find a stream of that kind called a river.

2734 Cross-examination.

By Mr. ASHBAUGH:

I saw the river from about five miles above Wichita to about twenty-five or thirty miles above. There was a town between the rivers, about eight miles above Wichita, but I cannot recall the name. It seems to me it was something like Moline. I
2735 couldn't tell you how many people there was in Wichita. It was a small place, I suppose two or three hundred, something like that. I don't remember meeting anybody there whose name I could now give you.

The Little river was probably twenty or thirty feet wide and probably six or eight inches deep. The Big river was probably a quarter of a mile wide. There were no trees on the sand bars there. There might have been sand bars there, but I don't remember,
2736 but no trees. We were along the river there about three weeks. I didn't see the river again only from the train, passing up and down. I never saw the Arkansas river in Kansas when it had any water in it; that is, none to speak of. I think it was in October, 1870, when I saw the river above Wichita as described.

Redirect examination.

By Mr. HAYT:

I passed along the river on the train, both in the day time and at night, I guess. I passed over that road pretty often, but I don't remember how the river was. I didn't pay any attention to it.

2737 HENRY T. GALBREATH, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I have lived in Colorado five and a half years, the last time. In 1861 I might say I was living on the Arkansas river. I travelled that summer. I have been a tramp most of my life—a retired

tramp, probably. I am yet in the business. I will soon be sixty-two years of age. I passed down the Arkansas river in 1861. We started twenty miles east of Pueblo, opposite the mouth of the Huerfano, and we travelled along the Arkansas river to where the road leaves the Arkansas river. Now it is called Ellinwood but it had no particular name then. There was an adobe and sod house about six miles east of the present Great Bend, maybe eight, somethink like that. I came back up the river that year. We were at
2738 what we called Coon creek. That would be about three or four days' travel west of that. I remember that very distinctly. We were on the river at Coon creek on the fourth of July, 1861. We went up the river as far as South park, Colorado, right up the river all the way. As we went down the Arkansas river that year there was very little water about Great Bend. After we passed Larned—that is where Pawnee fork comes in—there was reasonably enough water for cattle. We could water the cattle without any trouble after we passed Larned. There was just a little running water, but not any, you might say, above Coon creek, that is, about twenty miles above, as I remember it. We had trouble several days to water the cattle. We had sixty head of working cattle. When we came up the river there was plenty of water—considerably more than when we went down. There had been a rain above, but I couldn't tell just where it fell, but not a great ways from Dodge. In about a week after we struck the river we were all surprised to
2739 get out of the water. There was about two days the low bottoms on the Arkansas river overflowed from this flood, but in two days' travel we were out of the water. We believed it was local rains did it. After that we had some water, but only a little more than we had when we went down. We commenced to notice the scarcity of the water above the Cimarron, and then for two or three or four or five days we had very little water. Cimarron is about thirty miles above Dodge, as I remember it. For five or six days we had but little water, and then we began to get what we called the mountain water and had plenty of water then. We would generally dig a little well when we camped to get clear water.

In 1866 I passed along the river again. We came from Leavenworth on the Union Pacific railroad over to Great Bend and then up the river with three horses and a wagon. That is all the teams we had that year. I might say that we put in there the last week or two in May and the first week or two in June. There was plenty of water there.

2740 I made the trip again in 1868, coming this way. We passed from Great Bend all the way up to Pueblo in the latter part of May and first of June. We found plenty of water, enough for our purposes. If we had had a herd of cattle we would have had plenty but with just three horses we had no trouble in getting water for them. Others complained a little of the scarcity of water, but we had no occasion to. There was very little water running in the river for quite a ways, you might say all the

way from Great Bend, almost, to where Coolidge is now. It was called Big Timbers at that time. After we got above Coolidge there was plenty of water at the Big Timbers, or Pleasant Encampment, is what is called the Aubrey crossing. They are all right there at one place. I never went all the way down the river again
2741 until 1876. I shipped cattle down. There was not a great sight of water. After I got down always I noticed the water was scarce. I generally went down in October, but I would ship the cattle, of course, sometimes in November, after 1876, most every year. Sometimes two times a year I would go down with cattle. Most every fall I went with cattle, and frequently saw the river on those trips and at other times. I have seen it dry at Larned, and even down at Nickerson it was almost dry. We used to feed at Nickerson. In 1883 I travelled on the river that year from Larned east and found very little water. I had a bunch of about fifty horses, and we had to look a little out for water. We made the trip about the same months as the previous trips. From Larned east there was no time when we didn't find running water. I might have, but it would only be very short. If you went to the river to water stock you would find water, a little bit, going either up or down. I was not on the river at Larned. I came in from the northwest and went down the Smoky Hill country.

2742 I located in Kansas in 1883, in the town of Nickerson. I farmed in Kansas every year. The last six or eight years I farmed on the Arkansas river bottom on the south side of the river. The farm was about a mile and a half from the river, on the north side. That was from 1883 to 1898, you might say, at Nickerson, eleven miles west of Hutchinson, in Reno county. I noticed the water in the river from 1883 up to 1898. I generally noticed that. I lived right on the bank of the river. The first few years I was there I didn't pay much attention to it, but after I bought lands south of the river I crossed the river every day more or less, and I noticed the last six years I was there, every time I crossed it almost every day, if I went down, and often there would be a little stream of water running there. As compared with the previous
2743 year, the water in the river was increasing. I noticed that. I used to think the flow was steady, but once in a while there was a dry year, and of course that would make a difference, but on the whole there was more water. It was increasing. There was more water in 1884 than previously. I noticed it was increasing, I think about four years there. I don't think I saw the river there right under the bridge where I used to cross but there was a little running water there all the time for about four years. In the earlier years—you see the point I last mentioned was east of where I was in the earlier years—about thirty or forty miles east. When I first knew that country there was very little of it farmed, but to-day it is mostly farmed. This seems to have had the effect of holding the water from going into the river, and if I should find the river less in Kansas about Wichita of late

years than during the previous years I would attribute that
2744 to the local country there—the local conditions that I have just mentioned. Most Kansas farmers like water, and if any falls on their land they want to hold it. In the earlier years you would find portions of the river where there was no running water on top of the sand. I have noticed the river at different places. Quite often and most anywhere you might be able to find a spot, and then maybe the next mile you would find quite a little stream. In certain places the winds would strike the river and whip across and make a dry bed, and then it would rain in another direction and make quite a rise in the river, and it would have quite an effect on the river there at times. I have stated that in driving cattle up and down there several times I found plenty of water for stock. By that I mean so you could water cattle. I brought a herd of cattle up there in 1866 and it was the only herd that crossed the plains that year. It was not difficult to find water that year.
2745 We had no trouble. It was in 1861 that I had the trouble in getting water, going the other way. These cattle that I was driving belonged to me. I was the owner. They were my cattle. I was in the cattle business in those days. I only brought that one herd across. The cattle that I shipped were my cattle. In saying that my occupation was that of a tramp I meant I was a tramp four years—"bull-whacking." I don't mean what we call a hobo tramp. We had tramps of a different style in that country. I tramped across the plains and everywhere. I tramped because it was my business, and I accumulated a few dollars and got to owning cattle of my own, and was called a cattle king for a long time, and after a while I got tired of the title and quit. I am a tramp now. When I say I was tramping I mean to say I was "bull-whacking" and walked to drive the cattle in those early days.

2746 Cross-examination.

By Mr. ASHBAUGH:

I left Kansas the last time the last day of April, 1889. I was farming both ways from Nickerson—north and also across the river. The bridge was on my land one hundred feet. I had 296 acres in the tract south of the river. I owned it about six or eight years. I don't recall just how long. It was what we called first bottoms. There was a little strip of land right along the river bottom that was very low, just the height of the river bed, and then there was a little sand ridge right along there probably eight feet. That sloped back to the south to where in the dry time it was not more
2747 than two feet to water. Some of it was too wet to farm. We found water at about seven feet, but our well was about twenty-one feet deep. We struck a better stratum of water. It was what we call a drive well. We put that well down about 1890 or 1891. I don't know how deep it was to water in that well when I

left there. I didn't measure it. It was a drive pump. There
2748 was no very good way of telling the depth to water. It was in April that I went down the river to Ellinwood from Pueblo, in 1861. We put in all the time from about the 8th of April until about the first or second day of May, when we left the river. We travelled about fifteen miles a day. There was no high water in the river that spring. We met some water as we came back. The high water came about the 26th, 27th, 28th or 29th of June. It rained all night on us. The next time when we went to the Arkansas river we were surprised to see such a river. We
2749 were also surprised again in a few days to be above it. There was water in Cow creek that spring, and considerable water in the Walnut. We met the mountain water near what we called the Big Timbers, where Coolidge is now. That was when we came back that summer. We found it came from the mountains. That was our idea of it. The mountain water was muddy. It rolls through a dirty country. The wave of the mountain water maybe was a foot or a foot and a half high. It didn't last very long. We had water enough. Some of us used to go into the river almost every day to wash clothes, and we would wade out a foot deep or so. This high water passed down in two or three days, what we called the first wave, and the first water is always muddy water, when there is a roll of water passing down the stream. There was some-
2750 thing said about there being a drought through all that country in 1860 or 1861, but it didn't seem to affect anything where I was in particular. 1860 was generally known as a very dry year. I was on the Platte river that year, and it was a dry year there. 1861 was not as dry as 1860, but still the water was low. In 1862 I came up the Platte river again and went down the Platte in January, 1862, and then I came back again the last of June and July. I was in Denver in August, 1862. I had come up the Platte.
I went to the Arkansas and hauled hay there pretty nearly
2751 all of August, a little of September and part of October, 1862. I was there all of three months in 1863, hauling hay. We went down as far as to Fort Lyon, we called it then, at the Aubrey crossing. The real Cimarron crossing was down near Dodge City. In 1866 I came up the river from Great Bend and didn't find any high water in the river that summer. I got onto the Arkansas river that year about the 11th or 12th of July. When we got onto the river in 1866 I guess you might say there was a foot and a half of water where I first came to the river there at Great Bend, and then we came across what we called the dry route when we came over to Dodge. There didn't seem to be so much. And then up
. from there I would drive the cattle to the river where they
2752 would wade in, and they would get enough water. The river is variable during different times of the year. I think about April might be called the dryest month down there. If you would depend on the mountain water it would be a little late in the summer. Along down there it wouldn't get there until probably in

July, but they sometimes have floods or freshets. The mountain water would sometimes get there in June and sometimes it didn't get there, and sometimes it got there in July. In 1863 there was not much water down there, probably not over one-half as much as in 1862, because there was less snow and rain; but at Fort Lyon in 1862 the river was up considerably every day, though I crossed it nearly every day. The next year I had no trouble at all, in the same season; and then the next year I was at Pueblo. It was very full all summer. The water that fills the river in the spring may come from two sources. I lived on the river there about forty miles east of Pueblo several years. This high water
2753 would generally pass down in about a week or ten days as a rule. A little bit longer, maybe. But in a few days, it would pass down. I sometimes used to wade across the river and generally didn't have to wait long if I did. I went down the river in 1876 on the cars—shipping cattle—and then I passed up and down there almost every year. I don't remember that I saw any high water that year. There was one year after that that we had some high water, but I don't remember the year it was; but it didn't come down the Arkansas, it came down the Apishipa, every bit of it. There were heavy rains up the Apishipa. I was at Nickerson from 1883 to 1889, but I was not there during 1883, and I know the last few years I was there there was more water in the river than
2754 the first few years I was there. I was not familiar with conditions at Nickerson until I moved there. I used to pass through on the cars, but not to know much about the conditions of the country. I think what caused the increase in the water was the irrigation, if you want the question answered. That is the way I understood it. I have understood it so for fifteen years and longer. The irrigation in Colorado—the waste water strikes its level and when it does it strikes the level of the Arkansas river, and the more there is appropriated the more there is to run down the Arkansas river; so the more it is confined the more water will be found down there. If it went with a rush and was not taken out it would pass down before time. This waste water leaves the fields generally pretty close to the river—the early ditches. As a rule I think
2755 it leaves it on the surface. It is longer getting there and gets there during the dry season. If they take all of the water out of the river in Colorado for irrigation, certainly a part of it evaporates and there is not so much water to go down the river as though it had been allowed to flow right down, but it is longer getting there. During the late years I wouldn't think that the river could be as dry during the fall as it used to be. Whether it would be impossible for the river to have been dry for nine months in succession would depend on the seasons a good deal. I know down there where I was the water ran all the time of late years, and it didn't do it in the earlier years. If my theory is correct, it would be impossible for the river to be dry in the fall for any considerable period. If the river was absolutely dry from August, 1903, until May, 1904, it

would be contrary to my theory. Well, the seasons would regulate that.

Redirect examination.

By Mr. HAYT:

2756 If they took out fifteen or twenty ditches in Kansas and used the water it seems to me it would have the same effect as if it was used in Colorado. It would take it some time to get back to the river. Those ditches in Kansas are operated now, so far as I know. I don't know anything to the contrary. In 1860 I was only on the Arkansas river at Pueblo in the month of Octo-
2757 ber. I was not on the river that year in Kansas. I heard no complaints of the lowering of the water level in Kansas while I was there. I left Kansas in 1898 or 1899. It was five and a half years ago last May. I lived there about fifteen years.

Q. Did you notice any difference in the amount of crops grown during the last years you were there as compared with the former years?

A. Yes, they seemed to have increased. I heard a great many people say the same, men who had lived there six and eight years, when I left there.

Q. That is true of your crops, if I understand you correctly?

A. Yes sir.

I don't know how it is of late years. They report good
2758 crops—better than ever. I only know this through letters and from friends and acquaintances writing. (Objection.)

2759 F. W. SWANSON, Denver, Colorado.

Direct examination.

By Mr. HAYT:

My age is fifty-seven years, and my residence is Alamosa, Colorado. I am in the real estate and insurance business. I have been a resident of Alamosa for twenty-six years. That is on the Rio Grande river. I have been water commissioner for district No. 20, covering the Rio Grande and its tributaries in that district. I was water commissioner in 1900 and 1901. My duty was to distribute the water to each one that was entitled to it according to their appropriations. I had something over four hundred ditches under my jurisdiction.

Yes, I have lived in the State of Kansas. I lived there in 1868, 1869 and part of 1870. In 1868 while there I was hunting
2760 most of the time for buffaloes and wolves. We started from Ellsworth, Kansas, and followed the buffaloes over to the Arkansas river and crossed the Arkansas river at a place called Coon Creek bottoms. There was no city or town at that place, but it was

about twenty miles below Fort Dodge. It was in the fall of the year. That was the first I saw of the Arkansas river. In reference to running water in the Arkansas river, there wasn't any to amount to anything. There was no running water at that time. We just found water there in pools. We camped on the river for about a week, and hunted up and down the Arkansas river, mostly
2761 on foot. We left our horses at the camp and went afoot. As to travelling up and down the river, we never went out from our camp more than eight or ten miles at the most. We crossed the river and went up and down the river. We didn't have to go far for buffaloes.

I next saw the Arkansas river, after that hunting trip, in the fall of 1869. I was then employed by the Government doing carpenter work at Fort Dodge. I think this trip was in October that we started from Hayes City, and we were upon the river until the next May, in 1870, all the time from the fall of 1869 until May,
2762 1870. I was then travelling up and down the river. I was doing carpenter work, and during that winter the contractor, Fletcher, had not supplied beef for the fort, so I was selected to hunt buffaloes and to supply the meat for the fort for the mechanics and citizens working there. As to the condition of the river in the fall of 1869, there was scarcely any water. There would be a little here and there in water holes. I walked across the river very often, sometimes three or four times in one day. We used to go out and kill ducks or geese, and I could walk across without getting my feet wet, most of the time. There were little pools of water here and there in the river. These pools were not connected with one another by running water in the fall.

As to the winter of 1869–1870, well, towards the spring there was a little more water, and in April I remember once the water was quite high, but two days after I took the trip up the river about ten miles west of what they called Cimarron crossing, about thirty-five miles above Fort Dodge, the river was comparatively dry. It looked to me like it had been from rain or some other cause
2763 that the river was high below. And then I also camped on a creek called the Saw Log. The Saw Log is located about thirteen or fourteen miles from Fort Dodge, towards Hayes City. We camped there in the latter part of April, and we had to break camp on account of the water coming down there, and we moved over on the Arkansas river and found that dry, almost, so that the water must have come from up above somewhere in that creek. During those years we had awfully heavy rainfalls in May. I remember one storm distinctly. I was between the Walnut and Dodge. We had some teams coming across and the rain came down so that we had to unhitch our mules, and we could hardly stand up, and the water would be three or four inches deep on the open prairie in half an hour's time. I have seen more rain there in April and May than at any other time.

Yes, I came to Bent's fort in 1869, and at that point there was a

little more water in the river than below. From what I know of the water now and my recollection of the stream at that time, I should think it would have been as much as maybe a hun-
2764 dred cubic feet of water. It was about seventy-five to eighty feet wide, and not very deep. I was at that place in May, 1869. The river was quite wide there from bank to bank. The channel or the sandy bed of the river was quite wide. I didn't take particular notice of how wide it was, but down at Dodge I would say maybe from a quarter to half a mile wide.

I saw the river again in 1871 at Pueblo. I crossed there with a wagon in February, going into the San Juan country. There was some water in the river at that time, but not a great deal. You could easily cross it. There was a narrow channel in Pueblo. We crossed it very handily with wagons. I returned from that
2765 trip in the San Juan country in the fall, I believe, from there to Denver. On the return trip I crossed the river again at Pueblo. I think there was more water than when I crossed on the trip going out. I couldn't state the amount of water in the river, but we had no trouble in fording it at all.

Yes, I took up my residence in Pueblo in the spring of 1873, and lived there until the spring of 1877. I lived in that part of Pueblo called East Pueblo, in the house that is now used for the State asylum. It belonged at that time to Senator Chilcott. I rented the place from him and had some cattle and ran a dairy and farmed the place. I saw the river repeatedly in 1873 from the spring of the year until the fall of the year. In the months of May and
2766 June there was quite a little water for a while, but not very high water. In August there was very little water. The river never did go entirely dry, but got low in August and still lower in September. Yes, I lived near the banks of the Arkansas river and there were times that for a day or two the water would be very high and muddy, and sometimes it would be a kind of yellowish mud, sometimes grayish, like it came from different tributaries, from rain. The high water in the river ran down quickly. In a day or two it would be in the normal condition again. Yes, in 1874 I farmed that year on Chilcott's place. I had a little over thirty acres of corn, and the water was very scarce. I only saved about four acres of corn. Drought caused the loss of the balance of the corn.

Yes, I did something towards building an irrigating ditch in 1875. I had an irrigating ditch for this corn, but didn't irrigate
2767 it, because we didn't have the water. There was not enough water in the Arkansas river for us. We had to put in a dam, and that was more money than we could afford to expend. The ditch was built to take its water supply from the Arkansas river. At Pueblo the river is narrow there and the channel of the river in the middle is deep and in order to have plenty of water for the ditch it has to go up as high as the bank where the ditch is taken out. At the time I saw the river so very low at Pueblo I don't think there was to exceed two hundred cubic feet of water running up where our

headgate was. The general current was from ten to twelve
2768 inches deep and about forty to fifty feet wide. In 1875 I, with others, built an irrigating ditch that was then known as the Old Town ditch at Pueblo on the north side of the river. I helped to put in the headgate and build the flumes and put a dam at the headgate in order to get the water into the ditch. We got the ditch completed and had the water turned in, and about five miles from the headgate down the river was a dry arroyo that we had to build the ditch across, and a water-spout came down the arroyo and washed out the ditch so that we were not able to get any water through it after that. The ditch was about twelve or thirteen miles long, and at its headgate twelve feet wide. I didn't know at the time how many feet it was supposed to carry, but from appearances I should think it would carry from fifty to seventy-five cubic feet of water per second of time. We would not have gotten any water into that ditch if we had not built a dam in the river. When we built the dam we got quite a bit of water, maybe a hundred cubic feet or something of that kind. The intake of the ditch was built low for the purpose of taking water out of the river without a dam, but the water at that time got so low that we couldn't divert it into the ditch without a dam.

2769 In 1875 and 1876 I went up the river above Pueblo to fish. I generally went up as far as the mouth of Beaver creek, to what they call Carlisle spring. I used to take my family up there to camp. That is about twenty miles above Pueblo. And I made the trip in the summer time. In 1875 I found a great deal of water in the river. In 1876 I remember particularly with reference to the flow of water in the river—that there was no time that I couldn't wade across it. Of course I would get wet, but then I would wade across the river fishing, but below Pueblo I have gone down fishing when we used to catch the fish in deep holes. There was a small stream running in the sand and very little water running in the Arkansas river below Pueblo. That was true in 1875 and 1876, except occasionally there would be a freshet. I built a bridge on the Fountain creek, just east of the main town of Pueblo, and in two hours after the bridge was completed it was washed out by a water-spout.

There were frequent water-spouts came down the Fountain
2770 creek or some of those dry streams or arroyos. The Fountain creek discharges into the Arkansas river just below Pueblo, near the farm of a man by the name of Goldstein. Whenever the Fountain was high that way of course the river would rise, but it would run off very quickly. Sometimes there would just come a wave of water and it would just roll down and run off very quickly. These freshets or sudden rises in Fountain creek were caused by rains. I have sometimes seen a wave come down three feet abreast, just like a wave on the ocean, and in ten or twelve hours it would all be over and the Arkansas river would then go down
2771 to its normal condition. The Fountain creek was practically a dry stream during the summer months. It was just like

it is now, only I think I have seen more water in the last two years in the Fountain than I saw at that time. The last few years I have never seen it dry, in fact they are irrigating there now, what they couldn't do in the earlier days when I lived there. Several that I knew lived up there and tried to farm in the earlier days but couldn't. I don't know what to attribute the increase in the flow of the Fountain to except they preserve the water some way up above, which I do not know, and that it seeps back into the Fountain after it has been used up above for irrigation.

In these various trips I made up and down the Arkansas river in Kansas, hunting, I had to dig for water in the bed of the river to make coffee out of when I camped there. That was down below Fort Dodge, and more than one time. I often went to the river and I could find little holes by looking about on the river, little
2772 water holes along, so that I wouldn't have to dig. The bed of the Arkansas river in western Kansas and eastern Colorado is very sandy. The banks in different places are of different depths, in western Kansas and eastern Colorado, all the way from a foot to three feet in height. The banks of the Rio Grand river as it flows through the San Luis valley in Colorado are from six down to two feet or a foot and a half in places. (Objection.) As you go up the river the banks are lower. The bed of the Rio Grande is sandy, a great deal of the same kind of bottom in the river as in the Arkansas river. (Objection.) In performing my duties as water commissioner of that district on the Rio Grande river, I have had occasion to notice what is commonly termed return waters from irrigation. I have had occasion to have experience in that. (Objection.) I know at the Government measuring station above Del Norte there was less than one hundred cubic feet of water running
2773 through per second of time. At the same time, below Del Norte, down the river, clear down below Alamosa, I was distributing over three hundred feet of water into the different headgates. In speaking of the Government measuring station I refer to the station operated by the Federal Government which is located three or four miles west of Del Norte, up the river. There were no tributaries of the Rio Grande between that measuring station and the lowest point at which I distributed the water as above stated. There were no tributaries that were running water at that time. There were no rains along the river to augment the supply. I was travelling up the river daily in the performance of my duties. I worked about eighteen hours a day part of the time, and
2774 sometimes twenty-four. (Objection.) Yes, I distributed water to the most southerly ditch, which belonged to Mr. Wilkins. He was entitled to thirty-seven feet. He was getting over sixty feet. (Objection.) That was accounted for by seepage water seeping in from the surrounding country that had been irrigated. (Objection.) If I had wanted to stop that water going into his ditch I could not, because there was ten or twelve tight dams on the river between his ditch and Del Norte. Each dam was taking all the

water that was in the river, taking it out in a ditch, and a mile or two below there would be a running stream in the river again, returning from the irrigated lands surrounding. These ten or twelve tight dams were constructed to raise the water to run it into
2775 the headgates of the different ditches. (Objection.) And the reason Wilkins got more than he was entitled to was because those having a prior right were above where this water originated or came back into the river. I account for this return water where it measured only about one hundred cubic feet per second of time at the measuring station above Del Norte—and then I distributed something over three hundred cubic feet of water to the ditches below—by the fact that the water that has been used earlier in the season for irrigation purposes on the land would seek its level and run back into the river. Of course, it would take it a long time to run underground, and therefore in the latter part of the season there was always more water in the lower part of the river than at the upper end, and there was always more water at the lower end of the river in the valley than at the upper
2776 end, most of the years.

Cross-examination.

By Mr. ASHBAUGH:

During the years from 1868 up to 1870 I said that I sometimes found the Arkansas river dry. I occasionally found it when there was water in it for a few days all along the river, as I said. I was there along in April and May. I wouldn't be positive that I was along the river in June. I don't think I was. The highest water I ever saw in the Arkansas river was in April, 1870, above Fort
2777 Dodge. I was there all that month. It lasted four or five days. The river didn't go entirely dry then. I don't know anything about the mountain water. I have heard of mountain water. As to the snow melting in the mountains and running down the steam, I never heard it mentioned by the name of mountain water. I do know that the snows melt in the mountains and run down the Arkansas river. They commence about the latter part of February, I should think, or March, to some extent, and reach their highest stage about in May. The flow of this mountain water down in Kansas gradually rises, commencing, I guess, in the latter part of February, and I should think it keeps on until June and
2778 sometimes probably as late as July. I should judge that the highest water that I ever saw at the Cimarron crossing coming from the melting snows was not to exceed one hundred and fifty to two hundred feet. As to the depth in the river, that would depend on the different widths of places. In some places it would be deeper and in some shallower, according to the formation of the channel. It may have been seventy-five or eight- feet wide, and maybe six, eight or ten inches deep. That is the deepest I ever saw it at that point except when there were very heavy rains. I can't tell what the

rainfall in the eastern part of the State of Colorado is on an average. I don't know what the rainfall in western Kansas is on an aver-
2779 age. I don't know what the average flow of the Arkansas river is at Cañon City. I never had occasion to measure it. I couldn't average it, because I kept no account of the flow of the river. I couldn't tell what the average flow of the Arkansas river was at Pueblo because I didn't have the experience then that I have now. I couldn't answer as to the average flow of the Arkansas river at Pueblo during the time I lived there, as I said before, because I didn't have occasion to be on the river all the time.
2780 There was at the time I tried to get the water for the irrigating ditch maybe from one hundred and fifty to two hundred feet of water in the river. I don't know that that amount would be the average amount of water in the river during the time I lived there. (Objection.) I have seen more water in the river at Pueblo than there was at the time I just spoke of. Sometimes it would last a week and sometimes longer. This was above the mouth of the Fountain. It came down past Pueblo, but I couldn't say that it came past Cañon City, because I wasn't at Cañon City. There were lots of tributaries between Cañon City and Pueblo to furnish that water, and rain storms also. Rain storms are not as regular as the flow of the river up there. I never knew the river to go dry at Cañon City. I have known it to go very nearly dry at Pueblo. The first point down the river that I knew the river to go actually
2781 dry was down near what they call Coon Creek bottoms in Kansas between Fort Larned and Fort Dodge. I think there is more water flowing in the river in the State of Colorado at certain seasons of the year than there is in the State of Kansas. As to where that water goes to, I suppose some of it evaporates and some of it goes down into the sand and makes what we call an underflow. I suppose that underflow must have a current to some extent. It would most likely have to have a current. It would back up if there wasn't a current. I can't tell what the rate of the current is down there. (Objection.) I think there must be a flow to it, and that flow is down grade, I should think, and I shouldn't think
2782 it would go out of the valley and go up over the hills. (Objection.) My opinion about it is that it must have gone down
2783 the valley of the Arkansas river. I think the conditions of the Rio Grande valley are very much similar to the conditions in the Arkansas valley, only I think in the Arkansas valley the water is more confined than in the San Luis valley. I don't suppose there is any difference between seepage and return waters, and these terms are used synonymously. Water that flows on the surface would hardly be seepage or return water. It is almost impossible to tell, when you turn water onto land for irrigation purposes, how much of it evaporates and how much of it becomes return water. In some places, such as hay land, only a small portion is wasted or evaporates, and on plowed or farm land the great-
2785 est portion of it goes into the ground. I have never had any facilities to measure the water being turned out on a farm and

how much of it is returned so that I could give an estimate of it. I have not measured the flow that comes back into the river.

As to the place in the Rio Grande valley where there was one hundred feet above and I was turning out three hundred feet below, two hundred feet seeped in from the banks. (Objection.) The seepage water doesn't pass through the ground very fast. Of course it would be impossible for me to say what part of that water came through the ground and how fast it would come through.

2786 Some of this water that was coming down into the river again was used early in the season. It passed through the ground very slowly. It is impossible for me to tell, or for any other man, I think, to tell how far it would get in a day of twenty-four hours. There may be people who do know, but I do not. I will say this, that water that has been used say in May in the upper part of the valley will commence to come back into the river in July, thirty or forty miles below. I should think it would go a mile a month, but I wouldn't think it would go twenty-five miles a month. At least it is very slow.

Redirect examination.

By Mr. HAYT:

2787 As to the return waters that were heretofore spoken of by me as being over two hundred cubic feet at a point below when there was only one hundred cubic feet above, I did not mean that the two hundred feet came from the one hundred feet that was spread out on the land above. I meant that it comes from water that has been used early in the season and spread over the land when there is a great deal more water in the river that has been used on the land and sinks down into the gravel or sand and will form an underflow. I have had as high as five thousand feet and more at the measuring station. I have one canal that ran as high as fourteen hundred feet and the return water of which I have spoken comes from the general irrigation early in the year. In case the water returning from irrigation reaches the stream and flows in a body on the surface, I have no particular name for it except that it is returned to the river. It is return water all the same, and if this water seeps out after it has been spread upon the ground, into arroyos, and forms running streams to the river, as I understand it, that would be return waters.

2789 JAMES GALLENA, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I reside in Denver. I have lived there since 1888, and my business is contractor and plasterer. I formerly lived in the State of Kansas. I came into Kansas in 1866 and left there in 1888. I

came to the State of Kansas in 1866 to work for the Govern-
2790 ment at Fort Riley. I saw the Arkansas river in the latter part of September, 1866. A party of us went down where Wichita is now. There was a little settlement there on Chisholm creek. There was no Wichita. We were after buffaloes, At that time I was located at Junction City, about eighty-three miles, in a direct line, from Wichita. It is pretty hard to locate the particular part of the river where I was, but it was about four miles below where the city of Wichita is. At that time we rode across the Arkansas river half a dozen times between those two points and came back the same way. The Indians were pretty bad, and we came back the same way so as to strike into the settlements. We crossed the river three miles below Wichita and came back the same way. We forded the river. We passed above Wichita several seasons afterwards.

When I first saw the Arkansas river in September, 1866, the
2791 water in it was not up to the horses' ankles—up to the horses' knees—in the deepest places. At the deepest place where we crossed it it was not over three feet deep. The width of the river at that point I should judge was about three hundred and fifty yards. The stream of water, however, was probably two hundred yards wide, and the banks were sloped on both sides. I saw the river almost every year between 1866 and 1888, except the years 1871 and 1872. Sometimes in the spring there would be a flood there that would float a battle ship, and then along in June it would begin to go down and in July and August lots and lots of times at Wichita and Hutchinson I walked dry shod across the river. Yes, in June and July, both at Wichita and Hutchinson. I remember seeing the river in 1884 right there at Wichita at that time. In 1884 at Wichita there was a boom and everybody crowded down toward the river for town lots, as far as they could go. In 1884 we didn't have much water there. We had no trouble in getting all the sand we wanted out of the river at that time. Occasionally little flat-boats would come down. I can't remember or distinguish the month of September in 1884 as to running water. In 1884 we didn't have excessive rains there. I know that we got sand right straight along in 1884, with teams. We drove out into the river and loaded up. The teamsters did that. There was no trouble to drive in and cross the river. Yes, I remember 1887, but I wasn't in Wichita then; I was in Hutchinson. I repeatedly forded the river in 1887. In that
2793 year it was dry around Hutchinson and up above it, and in the fall of 1886–7 and winter I shot geese along the river. I wintered at Hutchinson. During those years I was hunting and passed up and down and across the river constantly.

I know where the Little Arkansas river enters into the Big Arkansas river. It is just above Wichita, about a mile above. I remember that they had the smallpox at one time in Wichita, and down below the bridge that goes over to West Wichita was what they called an island. They established a smallpox pesthouse on that

island and put a lot of smallpox patients in that pesthouse, but one night one of the inmates started out and walked across the river to
West Wichita. I think there was only about eight or nine
2794 inches of water in the river, to the best of my recollection. I
fished in the river there in 1886, and at one time I remember that the stream was no wider than this desk here. I don't suppose it was over eight feet wide. Then the water came up during the
week and then it must have been about four or five feet deep.
2795 It went down in three or four days after that. That was in
the latter part of June and July, 1886. At Wichita the river was just in the same condition in August, 1886. The point of which I am speaking, where the water was so low, was below the Little Arkansas river. I always supposed there was more water in the Little Arkansas river than there was in the big one. I have seen it
when there was water in the Little Arkansas river and none
2796 to speak of in the Big Arkansas river. I saw the Big river
repeatedly below the mouth of the Little Arkansas river in June, July and August, 1886, but I never saw any considerable water in it at any time during those months other than the few days I have mentioned as a time of freshets. We used to get most of our sand from about three-quarters of a mile to a mile below the mouth of the Little Arkansas river. I only went there once in a while.

I have farmed in the State of Kansas off and on from 1869. I have a place there yet, located eighteen miles south of Junction City, in Morris county. I last lived on that farm in 1881. While I was living in the vicinity of Wichita I became acquainted with a good many farmers through the country and they depended on the rainfall for the growing of crops. I never heard any of them claim at that time that the crops were moistened by water from the
Arkansas river. I paid no attention to that. I never heard
2797 that subject discussed by them. There were a great many
droughts throughout that part of Kansas during the time I lived there. There was a drought in 1866 when I came there, and in 1874 and in 1875 there were grasshoppers. Those droughts had the effect of burning up the crops. We had nothing. I noticed the difference between the crops that we raised on the uplands and those on the bottoms. The difference was that there was a crop in the bottom if properly attended to and there was no crop on the high prairie. There was a good, full crop down there in the bottom. I had twenty acres of bottom land myself. I don't know as I have seen an entire failure of crops on the bottoms. We would have something. After I got to Wichita I plastered a house in the country three miles west of Wichita and they had a failure of crops there—a failure of oats and a failure of corn. They were burned up. This failure occurred on what I would call the bottom lands
there. I don't know much about the difference between the
2798 bottom lands—as between those that are situated close to the
river and those half a mile away. My farming was all done

in Morris county. I know they usually had better crops on the bottom lands around Wichita than we ever had in Morris county, year in and year out.

Cross-examination.

By Mr. ASHBAUGH:

I saw the river in 1866, three miles below Wichita, and I was repeatedly along the river in 1867, 1868 and 1869. We crossed the river above Wichita in 1867. I went to Wichita in 1883, I think it was, or 1884. My memory is pretty treacherous upon those dates. When I was at Wichita in 1870 we were hunting buffaloes. I was
2799 at Wichita repeatedly between 1870 and 1883. I was not there in 1871 nor in 1872. I was there the latter part of 1873. The river in 1873 was as dry as a board where we crossed, about three miles below Wichita, the same place where we crossed in 1866. There was no bridge across the river at Douglas Ave. at that time. There was a cattle trail. In the grasshopper year I was up on the place. That year we crossed above Hutchinson. I was in Morris county in 1875. I was not down in the Arkansas
2800 valley at all. In 1876 I was at home. I don't think I was at Wichita in 1876. In 1877 I think I went to the Arkansas river. I am satisfied we did; but it was above Wichita. In 1878 I was along the river at Sterling. I don't think I was at Wichita in 1878, but was at Wichita in 1879. It was not much of a town
2801 then. In 1879, oh, there were eight or nine or ten thousand people there then. The bridge at that time had been built across the river. I suppose it was made of wood; I am not sure. Dates and circumstances, I lose track of them. The river at Douglas Ave. in Wichita in 1879 was about four hundred yards wide from bank to bank. I can't remember how much water there was in it in 1879. It was probably knee-deep. We forded it. The place where we forded it was right at Kincaid's place. We didn't ford it at Douglas Ave. I am not certain about the bridge being a wooden bridge, but I think the bridge was there at that time. I never saw a ferry at Wichita. There was no ferry there at any time I was ever there. I was never at Wichita in 1880. I think I was there in 1881. I can't state what kind of a bridge was across the
2802 river then. I didn't come to live at Wichita until 1884. I lived in Wichita in 1884, 1885 and 1886, and in 1887 went to Hutchinson. I lived there a year and then came out here. I was contracting and plastering in Wichita. I worked for myself. You have got me as to what buildings I built there. No prominent buildings of any consequence, but mostly four and five room frame houses. There was not a cellar that I know of in town. They didn't build cellars, because they struck water. The Citizens bank had a kind of cellar on Douglas Ave. in Wichita, but had to pump the water out every morning. As to how far down they would have to go before they struck water, I put a pump down in

the street at one place three and a half feet and struck water, about five blocks back from the river, on the east side. It was
2803 about four blocks north of Douglas Ave. and north on Main street but south of the Occidental hotel. The Occidental hotel is the third block north of Douglas Ave.

2804 We got the sand for our plastering out of the river. I never bothered about loading the sand myself; I had a teamster for that business. We got it from the east side of the river, the most convenient place we could get. He sometimes would drive across the river and get it from the sand bars over toward the west side. He waded across to those sand bars. I don't think there was any bridge across the river in 1873. Well, you have got me again. I have forgotten now whether there was or not.

2805 Examining Complainant's Exhibit A–1, I will say that picture looks like the bridge at Clark Kincaid's place the last time I crossed it there in 1886. It looks like that bridge. It don't look like the bridge at Douglas Ave. to me. I suppose it might be. It could be anything. The Arkansas river has been at times that I have seen it in such condition that that could be a picture of it. There was a flood there in the spring of 1886, I think it was, that came up pretty near touching the bridge. I think it did touch the bridge, if I am not mistaken. That would be ten or eleven feet up there, I should judge. Old Colonel Black's place was right on the bed of the Arkansas river near the bridge. He encroached on the river and planted some cottonwood trees on the right side
2806 of this bridge. That could not have been the Douglas Ave. bridge across the Arkansas river in 1886. I don't think it could. It don't look to me that it could be a bridge eight hundred feet wide and the river as shown in the picture eight hundred feet wide in 1886.

Examining Complainant's Exhibit A–2, I recognize that as the Douglas Ave. bridge in 1886. I can't guess as to the relative width of the river. Probably a quarter of a mile—four hundred and forty yards.

Complainant's Exhibit A–2 shows the river at high water,
2807 as it looks to me. If Exhibit A–1 is the Douglas Ave. bridge, it looks to me as showing high water. I can't tell from this picture how far it is from the surface of the water up to the bridge. (Objection.) I don't know that Exhibit A–1 is the old wooden bridge at Douglas Ave. showing the water at a low state. It might be, I suppose, but I don't recognize it as that. It don't look to me like a correct picture of the Douglas Ave. bridge on the Arkansas river at low water at any time before 1878.

Complainant's Exhibit A–3 looks like the Fort Scott bridge. I couldn't say that it is the Douglas Ave. bridge at Wichita.
2808 It don't look to me like any condition of the river or the bridge that I ever saw at Wichita. I don't remember that Exhibit A–3, so far as I can recollect, would show the river at a

medium low stage of water. I wouldn't state that that could not be a picture of the bridge across the Arkansas river at Wichita from 1879 to 1886 when I left there. Exhibit A–2 is the only bridge I recognize. I should not call the water as shown in Exhibit A–2 as either at a low or a high stage. I can't tell anything by that
2809 picture how high it is. (Objection.) I can't tell that the water as shown in that picture is ten or twelve or fourteen feet below the bridge. I guess, judging from that picture, that the water could rise ten feet and not strike the bridge. I have seen the river as shown in Exhibit A–2. I have seen it at high water and low water and no water at all. I have seen the river at the Douglas Ave. bridge with no water in it. As to how the water from the Little Arkansas river got down the river if there was no
2810 water in the Arkansas river at the Douglas Ave. bridge, it didn't get down. Time and again we crossed the river right there at Doc Black's place and didn't get our shoes wet. There was always more water in the Little Arkansas river when there was no water at all in the Big river. I don't remember whether I ever saw the Little Arkansas river when there was no running water in it or not. I didn't pay much attention to the water at that time. What caused me to pay more attention to the water in the Arkansas river was the sand question. I said there was always water in the Little Arkansas river when there was no water to speak of in the Big Arkansas river.

Redirect examination.

By Mr. HAYT:

2811 Yes, I recognize Exhibit A–2 as being the Douglas Ave. bridge at Wichita.

Q. Is that a wooden or an iron bridge?

A. Yes, a wooden bridge, and this is a wooden foot-board right along here. The frames and the uprights are all iron; the floor is wood.

I don't know when the bridge was built. They repaired it in 1886 and 1887, and in 1886 this foot-path was put across here on the side of the bridge. I think I crossed the bridge there in the '70's. I know I did. It was the year after the Santa Fe railroad ran down from Newton.

Yes, I stated that with good cultivation they could grow crops on the bottom lands up to the river at Wichita, and that was true during those dry years when there was no water in the river.

Recross-examination.

By Mr. ASHBAUGH:

2812 Yes, the bottom lands always produced good crops down there during those years when the uplands didn't always have good crops. I couldn't tell why it was. We had seasonable

rains then. I suppose the rains fell on the uplands, but the uplands were further to water. I don't know and I have not studied the question as to whether the good crops were dependent on the nearness of the water in the ground, but this at least is true—that they always have good crops on the bottom lands along the Arkansas river.

As to an inmate of the pesthouse walking out one night down on the island, I will say the island was on the west side and he walked across there because the island is on the west side of the river.

2813 B. D. SPENCER, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I was seventy-five years of age last March, and have resided in the State of Colorado forty-five and a half years. I have been engaged in various occupations. I freighted on the plains in the early days, was a merchant here in the early days, and have done mining and contracting. At the present time I am really doing nothing. I first settled in Denver. I was interested in the settlement business at Fort Lyon, Colorado, when it was called Fort Breckenridge, and the name was changed about that time. I was in partnership there with a man named Windsor. I think I went there in
2814 about 1859. I came here in 1858 or 1859 and went right down there, going there from Denver. I struck the Arkansas river first at Pueblo and then followed the river down to Fort Lyon. I made several trips from the latter part of 1860, I think, 1861, 1862 and 1863. I came from Salt Lake here about September, 1859, and I went down and went into partnership with Mr. Windsor. That was in 1859, in September. I was along the river repeatedly in 1860, 1861, 1862 and on up to 1864. In 1864 I sold out there and was married up at Boone's place, and then I came back to Denver. There were only two irrigation ditches on the river below Pueblo, between Pueblo and Fort Lyon, I think, at that time. A Mexican first settled the town of Pueblo. His name was Juan Jacqui,
2815 "Little John." This ditch came out of the Fountain, and I think was one-half or three-quarters of a mile long, and it ran down to the mouth of Fountain creek, and there was about sixty or eighty acres of very low bottom land. I suppose the ditch was four feet wide and two feet deep. The second ditch was taken out by a man by the name of Joe Doyle, on the Huerfano, twenty-five miles south of Pueblo. He had a large place beyond there at that time. That was above the mouth of the Huerfano, about twenty-five miles from Pueblo, and I saw it in 1859 and 1860, along there. There was one ditch built between Pueblo and Fort Lyon a little after that. I bought Doyle's corn in 1860, a little Mexican corn raised there. I hauled it to Fort Lyon and a man by the name of

Hicklin lived on what is called the Green Horn. It is called Hicklin's ranch yet, I guess. He took out a little ditch to raise corn. His ditch was about a mile and a half long and about four feet wide and a foot deep. The Doyle ditch was the
2816 biggest of all of them. That was, I guess, four or five feet wide and twenty inches deep. The Arkansas in two of the years, and it might be three, between 1859 and 1864, got quite dry after you got below what was called the Big Timbers, below Fort Lyon, in two of those years anyhow. In 1861 and 1862 the river went dry. There was a flow of water until you got below the Big Timbers, just as it is on the Platte here, a flow of water below Fremont's orchards, then after that until you passed the Big Timbers it got dry. It did the same thing here. It was dry from about the first of August until the last of September, about the time I was passing over the road—that road sometimes and this one sometimes. From about the first of August during all of September and maybe into October. That was during the years 1860, 1861, 1862 and 1863, up to 1864. I was married in 1864 and then sold out my interests down there and left the Arkansas river and came to Denver. No, in 1864 there was plenty of water in every part of the river I saw.

There was more rain. I don't know as the river ran dry
2817 every year before that time. There was more water in 1860 than in 1861. The dry part of this period was in 1861, 1862 and 1863. That is my recollection. There was no water in the river after you got below what we called Big Timbers then. They are all cut away now, I suppose. I mean the river was dry, more so in 1861 and 1862, and one could find no water in the river during that dry time below the Big Timbers. There were not many people around camping in those days, and they could find where the river would wash out next to a bank somewhere, wash out the sand a little more than at other places, and they would dig for water, and in going down to the river you would always watch for the wagon track going into the river. It would go to one of those places where the seepage water was, Sometimes you would dig a little deeper than others. Generally you would find a little seepage water in those holes. There was no running water in the river, of course, anywhere; it was dry. Yes, we went below the point designated as the Big Timbers. I am not very clear about that, because these names on the map now were not the names used in those days. They didn't have many names on the streams or towns or settlements in that country. I recollect I went below the Big
2818 Timbers at one time about fifty miles, following the trail on down the river. That was the Santa Fe trail. There was no other trail, much. I think it was maybe fifty or seventy-five miles down below Big Timbers. That was in the year 1861, I think, and the water got so scarce that we left the river and struck off a little nearer road to Kansas City—a little nearer trail—and left it on account of the water, and the first stream we struck, I think, was the Little Arkansas, about ten or

fifteen miles from the mouth of that stream, and there we found plenty of water. I guess that must be the Little Arkansas that comes in near Wichita. Pawnee creek and the Little Arkansas—I may have got them mixed. Maybe it was Pawnee creek we struck. The Big Arkansas river was dry that year after we passed the Big Timbers. I think we made this trip in August or September. I had been down once before and back. You see I was getting some corn out for the Government to Fort Lyon. They were out of corn and I was skirmishing around up this way to get corn of Doyle and those people. I got what they had; they didn't have much. Then
I had to get some corn quick and I was back and forth hurry-
2819 ing them up with the corn. That is why I made so many
trips. There was water in the river in May, June and July, I think, in 1861. There was as far as Fort Lyon, but I don't think I was below there. We used to go in bathing at Fort Lyon. The river was probably three hundred feet wide and an average, probably, of six inches deep up there. If you got below that the water spread out more and was shallower. I have described it for you below that point, but merely to give you an idea I said in some places it looked like it was a mile wide and an inch deep, and I said that to show it would be almost impossible to get the water in a ditch down there. It can't be done. You can't make any dam that will withstand these freshets you know. It is all quicksand. I don't believe I could state the amount of water in 1861 in May and June when the water commenced to go down and when the river first ran
dry that year. The conditions there with reference to water
2820 were about the same in 1862 as in 1861. Yes, just about. I
think there was a little more water in 1863, and there was quite a plenty in 1864. The water commenced to run quite plenty in the latter year. I left there that year and sold out. I sold out in September and went up to Boone's place. He lived up there twenty miles below Pueblo, and I stayed around there I guess a week or two and then came up here (Denver). I think the place called Big Timbers is about fifty miles below the State line between Kansas and Cororado. The timbers began right there at old Fort Lyon and ran about fifty miles down the river. There had been two Fort Lyons—one designated as Old Fort Lyon, and that is entirely abandoned. Old Fort Lyon was just below the mouth of a creek called the Big Sandy, coming from the north. New Fort Lyon
would now be right opposite Las Animas, right across the
2821 river from Las Animas. They were about five miles apart—
I mean the new Fort Lyon was five miles from Las Animas, across the river. The old Fort Lyon would be twenty or twenty-five miles farther down the river, I think. The new Fort Lyon is up the river. I have not been familiar with the river to any extent since 1864. I have only been to Pueblo you might say.

Cross-examination.

By Mr. ASHBAUGH:

The drought, as I suppose, was in 1861 and 1862, and may have affected the rivers during those years and may have begun
2822 back in 1859 and lasted two or three years. There was less water in the river for two hundred miles in the western part of Kansas than there was through the part of Colorado east of the mountains in those early days. A great deal of the water in that stream in those early days was freshet water from the mountain spouts and heavy snows in the mountains, and it ran down and we had none left. That is the best answer I can give you. It was freshet water strictly and just allowed to run wild. During the dry season from 1859 to 1864 there was more water in the river in the State of Colorado than there was in the river in the western part of Kansas. I don't know how to answer the question as to what caused that difference in the amount of flow. In western Kansas there was not a great deal to sink in the sand. It disappeared in the sand after you got below Fort Lyon. What water was flowing visibly in the river in Colorado during the dry seasons of the year would sink into the sands as the flow passed down into Kansas. It would sink into the sands, because you could dig and get it. I think that is evidence that it sank into the sand.

2823 Redirect examination.

By Mr. HAYT:

There was considerable evaporation from the winds and the sun. I don't know that I saw the river for two hundred miles east of the Colorado line, but about one hundred and fifty miles, and that was on our trips from Fort Lyon to Kansas City. I went down the river in 1861 and left the river to get camp water, and that was on
2824 the Pawnee or Little Arkansas, and we didn't go back to the Big river at all. We generally had freshets in May and they would last about thirty days generally. We had ferries in Denver across the Platte and right there at Cherry creek, for stage and other purposes, along about that time. I have thought a good deal about the water in the river since the irrigating in Colorado, and I believe they have got reservoirs and ditches sufficient to take out this freshet water that is going to waste and to impound it in reservoirs and ditches and spread it over the country. It goes to the bed rock and some of it I think takes a year to get back to the natural stream. That equalizes the water in those rivers all through until September and October and all through the winter. It may get back in some places where it is steep in a month or two, and in other places where it is flat it will take it a year to get back, some of their water. Now, that is proven out here in what is called the broken loop. There is a creek there that is dry, I know that. There was never water in that creek until the English company built what is

called the English Highline canal, and they irrigated at the head of this creek and now there is plenty of water in it. There is water taken out of that creek now all the time; they get it from this English company's canal all the year round.

2826 COLORADO SPRINGS, COLORADO, December 12, 1904.

ROBERT FINLEY, Colorado Springs, Colorado.

Direct examination.

By Mr. DAWSON:

I am living at Colorado City, Colorado, and have lived in
2827 this country forty-four years past. I first saw the Arkansas river in Kansas about the middle of May, 1860, when I was coming out to this country on what was called the Kansas City and Santa Fe wagon road. I think it struck the Arkansas about the Big Bend. We followed that road out. I think it was somewhere near where Great Bend in Kansas is now. We left Westport in Kansas about the first of May and got here about the 16th of June, travelling with ox teams. From that point where we struck the river we followed it up to near Pueblo in Colorado. All I can recollect about the river in the neighborhood of Great Bend is that when we came out I herded cattle, just the same as the others. The cattle, whenever they were up the river, would go across on the opposite side. There was no water in the river, only a little bit. Up at Fort Lyon
2828 the cattle got in the habit of going across, and they got past me one night and jumped across the river. I had occasion to cross the river on foot near Great Bend in bringing the cattle over, and there was not sufficient water there to cause me any inconvenience in wading. I couldn't tell about how deep the river was. All I remember is that little circumstance. It was very shallow. I couldn't say how the water at Fort Lyon compared with that at Great Bend. I know it was deep enough to swim cattle over, that is all, in 1860. There appeared to be a great deal more, but there were no rains that I know of while we were travelling between the two places.

I have been living here forty-four years at Colorado City and have been occasionally down the Fountain. I have been farming,
2829 running a ranch and doing surveying, and have run out a great many ditches as civil engineer from the Fountain. The Fountain heads in El Paso county, up here near Pike's peak. The main branch of the Fountain is around Pike's peak and runs from there nearly south—a little southeast—and empties into the Arkansas river at Pueblo. I hardly think there would be any difference in the permanency of the flow of water in the Fountain in the early years and in later years, but I have not been down
2830 there in the last seven or eight years. We have a great deal of water sometimes, and other years it is scarce. I don't know anything about it during the last season or in late

years. I have never been very well acquainted with the lower Fountain above Pueblo. I have never been down there but little for a good many years and I have not had occasion to observe the effect of irrigation upon the stream, in regard to seepage or return waters.

Cross-examination.

By Mr. ASHBAUGH:

We left Westport, near Kansas City, about the first of May, 1860, and struck the river at Great Bend, and arrived at Pueblo on the 16th of June. We travelled with ox teams about ten or fifteen miles a day. I don't recollect how deep or wide the river was. I could
2831 not tell whether there was a great drought through that part of the country. It was my first year in the country and I don't remember anything about the conditions. Up at Fort Lyon a few of our cattle got away. A few of them plunged into the river near Pueblo, and I noticed it made them swim and they swam back to the same side they went in from. This was near Fort Lyon, below Las Animas.

I am seventy-four years of age.

2832 ANTHONY BOTT, Colorado Springs, Colorado.

Direct examination.

By Mr. DAWSON:

I live at Colorado City, Colorado, and have been in this part of the country since 1858. I first saw the Arkansas river in 1858, in about the month of September, at a point we called the Great Bend of the Arkansas at that time. I was travelling with ox teams and we came up the Arkansas river to the Fountain here, and from about Fountain City down here about fifteen miles below we went north to Cherry creek and from there to the Platte river. There was no flowing water in the Arkansas where we struck the river near Great Bend, about either the first day or the second day
2833 in September, 1858. There were pools of water that you could go around and cross the river dry shod. I couldn't tell how far up the stream that condition continued. I don't know that it continued for any great distance from there, from this time that I remember that I crossed the river dry-footed. I think it was about the noon camp. The cattle went down to drink at these pools and I went down to get water for the camp and looked around and of course I crossed the river. I crossed it dry-footed, without wetting my feet. There was only these pools standing in the river bed, pools of water that came up through the surface, and I went around them in some places, and jumped over them. The sand was exposed, in little ridges. Not much of ridges, but enough so that the water came to the surface in places. The next

that I remember where we got water again, there was flowing water again above, especially when we got up to Bent's old fort. I think there there was a steady, flowing stream and lots of water.
2834 There was running water, considerable water, in the Arkansas river from there, and there was some in the Fountain. In 1864 I was with the Chivington expedition down the Arkansas. Of course since that time I have passed up and down that railroad a great many times. I don't remember how far the expedition went, but it was a considerable distance. Really, I don't know how far. I think at a point called Big Timbers. Perhaps we went down farther. I am not clear how far we did go down and crossed the river. The Indians crossed it down there somewhere, and my impression now is that it was at the point called Big Timbers, but we didn't go so far down as where we struck it in 1858, at the point we called Great Bend. I think the Chivington expedition was near the first of December. I don't remember what day the battle was, but I was in the battle; and from the battle grounds we started down Sand creek and struck the Arkansas down there and followed the Indians and finally after two or three days the Indians crossed the river and scattered. I think there was water above in the river that year. I don't remember down there. I don't remember that we crossed the river there, but I think a lot of soldiers did cross the river and follow the Indians. I have been acquainted with Fountain creek during all of the years since 1858. There was no irrigation on the Fountain at the time I first came here. Of course I have lived most all of this time on the Fountain here and have been engaged a good deal in farming twenty-five miles below here on the Fountain. In the early days, about 1862 or 1863, I had a claim on the Fountain about twenty-two or twenty-three
2536 miles below here near where the Woodbury ranch now is. I farmed by irrigation. Most of the farming is done here principally by irrigation. There is very little without it. I think the irrigation has increased the flow of the water in the Fountain; that is, it has made a more permanent flow of water than there was in the early days. Nobody can tell you now in what way the water ran off or passed down the streams in the early days. The seasons differ here. We have rainy seasons and dry seasons, and they differ in time. We sometimes get early rains in the early spring, and floods, and again we don't get them until fall, and some seasons we don't get any. I think the water is taken in by the soil we irrigate, and of course a good deal of it will come out again. It will come out into the bed again some place, possibly near the farm, and I should judge in some places farther away or at a distance away from the farm; but I think most of this water that we put on lands for farming purposes will find its way into the creek bed again or into the channel, for instance, of the Fountain here, and from the Fountain into the Arkansas.
2837 Putting it on the ground has a tendency to hold it back and make it go off more slowly. Of course when there is water

in the streams the farmers can take water. When there is none they can't take any and distribute it over the land, but when there is water in the streams, more or less, the ditches are running. When they are taking water out in the ditches at the head of a stream or at the upper end it causes springs along the stream, and of course in that way there is water in the stream that would not be in it were it not for the fact that there had been some farming done—some water taken out and put on the land. For instance, I know from experience on my land here at Colorado City I used to have a big flow of water on that land for farming purposes, and also for hay purposes finally, and I noticed that it caused springs to spring out on the banks of the creek and from there into the main creek again. Well, since I have quit farming that land extensively as I did then I notice these springs have dried up again, and before I commenced farming there there were no springs, and after I commenced
2838 farming and irrigating there were springs. I know this from the wells I dug. I laid out a portion of the land into lots finally, about ten or fifteen years ago, and sank wells over the land for water purposes, and in the fall I would have plenty of water in the wells, but during the winter I wouldn't irrigate, or there was no irrigating done any more, and in the spring I wouldn't have much water in the wells from the fact that there had not been much water on the land for a year or two. When I laid out the land of course I didn't irrigate it any more, and just before that my land was all covered with—of course I irrigated the grass land, and I got water in the boulders, that is, about twenty feet deep. I got water very easily, and towards spring the water would drop again in the boulders, because there hadn't been any water on the land during the winter. I have noticed the creek at a place where some ditch had taken all of the water and then noticed the creek at some point below, but I couldn't give any particular point only as going up and down the Fountain from here to Pueblo. I passed up and down frequently in the summer time and in the summer of 1863 I was farming down there and everything was dry up and down the Fountain. Since that time whenever I passed up and down I noticed that there was more water, no matter how dry the season was—that there was more water in the Fountain at that season than when I was farming down there in 1863, in the dry seasons. I
2839 noticed pools of apparently flowing water in the Fountain when I knew that season everything was dry down to Pueblo. I think I have noticed where a ditch took all of the water out of the creek and then see water at the head of other ditches miles below, but I couldn't give any particular point. I think that was the case where I was in 1863 that parties had a little underflow of water in the creek for their ditches. I was only told that. I didn't see it.

Cross-examination.

By Mr. ASHBAUGH:

The wells I spoke of were about twenty feet deep. Up this way the water is flowing all the time in the Fountain when it is not taken out by ditches. When it is taken out by ditches at times up in my neighborhood here there is very little water in the
2840 creek sometimes. This is in July and September. The water is all taken out of the Fountain now for irrigation purposes except when the creek is unusually high. Of course there are times when there are floods in the creek, when it could not be all taken out, which would last some time. There are seasons like last summer (1904) that I guess there was water in the river all the way down to Pueblo. The summer of 1904 was an unusually wet season. I should judge that the normal flow of the Fountain through this part of its course is practically all taken for irrigation purposes. There is not water enough. I should judge there is not water enough for the number of ditches there are. Along the upper part of the Fountain they don't get as much water as they can take or as they need during the irrigation seasons. In the Fountain below here there is not water enough during the average year. As far as I know, there was not water enough when I was down there in 1863, when there was very little farming done in the country. When I
2841 farmed in 1863 we didn't have water enough in some parts of the summer. We suffered somewhat for water. I think there is more water now for the last ten years than there was for the ten years of the '70's in the Fountain.

2842 There are lots of irrigating ditches on the Fountain between here and Pueblo. Some seasons they don't get enough water during the irrigating season. The season of the year when I spoke of the Arkansas river not having any flowing water in it must have been in the month of September. I don't know how long that dry condition existed. We only stayed there and came right along at the rate of fifteen or twenty miles a day, you know. I don't
2843 know how far it is from Great Bend to Fort Lyon. We must have been on the river ten or twenty days. There was no place on the river that we could not get water for our stock, because at this point that I remember well of where I crossed the river dry-footed there was water pools there where the cattle could get enough water by scattering out. There was lots of water at Bent's fort. This water sank. It sank in going down. As it went down in the bed of the river of course it got less and less. It sank in the sands. And at this dry point where these pools were it would come to the surface. I have noticed that in the Fountain here the water would rise in the afternoon and there would be more water than in the morning, from the fact that the water was held back in the night time. As it comes down off the mountains here of course it
2844 was held back during the night time and came down in the day time. That water must have melted during the day or

melted in the morning. The supply of water of the Fountain all comes off Pike's peak in different branches or up Cheyenne creek here. Yes, the uniform regular flow of the Fountain is all supplied from the melting of snows on the mountains around here and from the rains falling on the mountains, and this is supplemented by the rain storms down here on the foot hills or the plains or the valleys. The Fountain draws some water from the divide up near Palmer lake as well as from Pike's peak.

2845 HENRY MCALLISTER, Colorado Springs, Colorado.

Direct examination.

By Mr. DAWSON:

I am living at Colorado Springs, Colorado, and have lived in this part of the country since the tenth of April, 1872. About that time I saw the Arkansas river first at Pueblo. I had seen it several times below Pueblo, but not very far until the latter part of July, 1873. I was then down at a point about eleven miles east of the mouth of the Las Animas river. That was some distance below old Fort Lyon. At that time—I was nearby there three days and crossed the river three times on foot. It was dry. On the south side of the river where the sand was something lower than it was on the north side, where the current had been just before it went dry, the sand was moist or wet but there was no water running in it when I was there. I did not at any time after that have occasion or opportunity to observe the river that far east. I have been ac-

quainted with the Fountain for about thirty-two years, and
2846 have had occasion to observe the increase in the number of ditches taken from the creek in that time and the quantity of ground under irrigation now is larger than it was thirty-two years ago. Of course I knew nothing of the Fountain until early in 1872, but my experience has been that the flow of the water in Fountain creek is larger during the summer season, and particularly the late summer season, now, than it used to be before many of the ditches that are now flowing were created. The flow is more regular and comes from a number of sources that were not known at that time. I think the greater regularity is due to the distribution of the waters on either side of the creek through the many irrigating ditches. It has greatly increased the seepage in many places. For instance, when I came here in 1872 there was no water

flowing in the little stream along the eastern side of the
2847 town of Colorado Springs known as Shook's run. At that time there was no running water in Shook's run. After we brought the water from the mountains or from Fountain creek near the mountains by our canal—the El Paso canal—water commenced running in Shook's run and it has run in a considerable stream ever since, winter and summer. The water brought in this canal was used for the purpose of supplying this town with irrigating

water, and it practically supplied it also with water for drinking and culinary purposes. We dug a large number of wells on this town site in the latter part of 1871 and 1872 and found water in none of them. We were upon the point of abandoning the site as a site for a town when we turned the water into the canal that supplied the town or that was to supply the town when the wells that we had previously dug and that were dry filled up to the extent of several feet, and for several years we drew our water supply from those wells. These wells were filled up from the sub-
2848 soil bottom and not from the top. They were filled from the soaking of the soil. There was no water running into the tops of the wells. When the water from this canal was distributed over the town site of Colorado Springs for irrigating purposes the natural slope or drainage was towards the east and the south. Shook's run lies along the eastern borders of the thickly built up part of the town. It was formerly, prior to the time of the construction of this canal, known in this part of the country as a dry creek or arroyo. The water running in that stream since the canal has been used was only occasionally turned in from the surface, sometimes only once a year, where this ditch crossed it some two miles above and ran around on the hill-side east of Shook's run, but it was very rarely turned into it directly. When it was not turned into it directly it derived the water by seepage only, the banks in many places being quagmires, as well as the land immediately south of the town which it drained into the Fountain. The ground lying immediately south of the town since the irrigation of lands has been made wet and swampy where it was formerly as dry as a
2849 bone. This swampy land drains into the Fountain and partly into Shook's run, and Shook's run empties into the Fountain. I have one particular instance in mind showing the effect of irrigation upon adjacent streams or draws. Until recently I owned a ranch about two or two and a half miles southeast of town on the Fountain. I moved there in 1888. At that time a stream or a dry gulch ran through the farm which run water only after a heavy rain. Two years after that the city impounded a part of the water that was carried in a pipe from Bear creek, leading from the lower part of the town, in a reservoir out on the hill east of town, and in about two months after the reservoir was filled the water commenced running on the surface down this creek that had been formerly dry. The quantity of water increased and the whole hillside on my place, half a mile to a mile below the reservoir, became a quagmire, and the hillside yielded down toward the creek and one could hear the water running out of the hillside at half a mile distant, and that continued until it reached about five cubic feet per second, and it continued that way until lately when the city did something in the way of puddling the reservoir, and since then the water has lessened in the creek, but it is still flowing in considerable quantities. Until that puddling was done that
2850 creek became a considerable tributary to the Fountain. I have had occasion to notice the flow of water in the lower

Fountain south of Colorado Springs and to compare the volume of water in late years with former years, and in my opinion the flow of water during the summer months has increased.

Cross-examination.

By Mr. ASHBAUGH:

The sources of the water of the Fountain during the early season I should say were mostly from melting snows in the gulches and ravines on the north side of Pike's peak, and that is supplemented later in the season by rains. The snow soon melts on the tributaries of the Fountain creek. It does not run very far in the mountains through any snowy country excepting the top of Pike's peak, but as the snows melt the waters go down and saturate the ground, and the ground along the sources of the Monument keeps giving out water from the melting snows that saturate the ground in that way until the later part of June and July when the heavy summer rains usually commence. As to the average season for the melting of snows,
2851 there is usually very little snow to be found after the 4th of July. The quantity of snow on Pike's peak usually increases until the middle of April. The snow on the mountains is actively melting, I should say, for not over two months. But there is a little snow melting at different times of the year. The greater part of the snow melts in May, some melting in March and some in February. When the water was taken out in the canals, or for city purposes or for irrigation purposes below, that caused the flow of water underneath the soil toward the outlet, and that has continued
2852 in proportion to the amount of water that has been supplied on the upper lands. I think if the water of the Fountain creek or in the Monument, one of its tributaries, was all distributed in the winter and spring there would be an abundance of water in the Fountain creek every summer to irrigate every acre of land between here and its mouth. I think it would be practicable from an engineering standpoint to store that water and finally distribute it in that way. Whether it would pay or not I do not know. The water I spoke of coming into the wells came in about eight feet deep in my well. If that water was withdrawn from the lands from which it went into the wells, they would doubtless go dry again.
2853 So when this water was put upon this land it supplied an underflow toward these streams and outlets; but this water of course did not come near enough to the surface to be of any value for crops. I suppose it went down until it found either a rock bottom or shale or clay or something that was solid enough to make a bed for it to flow on. I have never had implicit faith in the ability to hold back the waters of our mountain streams to any great extent by means of reservoirs; but that can be done to an extent considerably beyond what is being done now. But this whole country is liable to water spouts that would be very likely to carry cut any reservoir that might be built in the locality in which the

water spouts were. This, however, would of course go to the
2854 question of civil engineering. The main value of any reservoirs that I believe could be made would be in the seepage of those reservoirs rather than the drawing of water directly from them in ditches.

Old Fort Lyon on the Arkansas river was two or three miles north of the river and ten or twelve miles west of the town of Las Animas. When I saw the river below Fort Lyon I cannot now tell whether there was any water in the river or not, but there was considerable water in the river at Pueblo. There was no flowing water in the Arkansas river near Fort Lyon where I crossed it. I think it had gone down into the bed of the creek, into the sands. I can-
2855 not account for it in any other way. Then flowing on down the valley again. When the water is put on land for irrigation it is a difficult matter to say how much is lost through evaporation, but I think when you run water on land very little of that water after it gets on the land is lost by evaporation. (Objection.) It practically all goes down into the ground. The greatest amount of evaporation is in June after it has been spread out upon the land. I cannot tell what proportion finally gets back into the creek as seepage. Of course it depends a good deal on the character
2856 of the ground, and possibly on the year, too. A great deal more will evaporate in a hot, dry year than in a damp, cool year. In some places and over some limited areas the seepage may be very little or none, while in other places nearly all that you run on the ground will seep off. This depends on how far from the surface the impervious shale or clay may be. A fine, thick, heavy adobe soil will have less seepage and more evaporation than a sandy soil. But very little more evaporation, because those who irrigate would not run so much water upon a heavy soil. The longer it takes to seep away the longer it is there for evaporation, but it don't take it long to seep away. The water would not stay upon the surface because the surface would be damp. The
2857 evaporation would go on all winter, for that matter, as the water keeps coming up to the surface and evaporates. I can't give anything like an estimate of the amount of water that becomes seepage and finally gets back into the creek in proportion to the amount of water that was put on the soil for irrigation purposes, but I should say that a vast majority of the water that is run on ground goes down in the ground and comes out in the way of seepage somewhere. A great deal of it goes into plant life, and some evaporates. I should say very much more than half of the water that is run on ground in this part of the country comes out again. It goes down into the ground into an impervious bed and comes out in the
2858 streams below—the natural drainage. (Objection.) I think a good deal depends on the condition of the ground. If the ground is very dry most of the water that is run on it the first irrigation will stay there near the surface, but after the first irrigation the drainage is very much greater and is very considerable.

Redirect examination.

By Mr. DAWSON:

The character of the soil along the Fountain is largely a sandy loam, in some places very sandy or gravelly. (Objection.) In some places along the first bottom of the Fountain creek below here the gravel is very near the surface. There is a pitch everywhere toward the stream. The drainage is toward the stream. The first bottom would be nearly level in most places, but there is a second
2859 bottom upon which most of the crops grow, I think. The second bottom pitches toward the Fountain and is more gravelly than the first bottom, and in some places the seepage is so great that it is not necessary to irrigate the low bottom at all. I know of meadows that are not irrigated at all. That is where lands lying above them are irrigated for other crops and the water seeps from the upper levels to the lower meadows. The irrigated farms along the Fountain, generally speaking, are very seldom a mile from the creek, and are near to the stream. The Fountain drains no other country except a limited basin bounded on the south side by Pike's peak, on the west by Hayden's divide and on the north by the range of mountains within sight. The source of the water of the Fountain is quite limited. It drains the country which is commonly known as the divide, on which is situated Palmer lake, Colorado, and it drains that through its tributary, Monument creek, reaching about twenty-five miles north of us; but most of that water, excepting in summer time after heavy rains, comes from the moun-
2860 tain tributaries west—the Monument and other streams. It drains some country lying to the east of the stream through two tributaries. The mountain drainage is very much heavier than the drainage from other sources, excepting after heavy local rains in the summer time when some of the eastern tributaries of the Monument are in a flooded condition for a few hours only. I allude only to that part of the Fountain and Monument above us here and west of Colorado Springs. There is a good deal of the drainage of the Fountain that lies south and east of here that is not in the mountains. Some forty-five miles of it is on the creek. The country called the Divide is a country of more rain in the summer than we have here or south of us. It is one of the wettest countries from rain that we have in this part of Colorado. The rainfall up there is sufficient to grow crops that would dry out here in a very few weeks.

Recross-examination.

By Mr. ASHBAUGH:

2861 The area of drainage, when estimated in square miles, does not indicate in itself anything as to the amount of either snow or water that falls upon it. If the waterfall was fifteen inches a year, that would be fifteen inches all over that water-shed. It de-

pends a good deal upon the character of the country. If the natural fall of a square mile of land was very great, the water from a foot of snow would run off very much quicker than if that ground was level or nearly level. If one stream, for instance, had five miles of a drainage area and another stream had twenty-five miles of a drainage area, that in itself does not indicate that the second one has five times as much water to run off as the first, and particularly if one originates in the mountains and the other in the plains.

2863 T. B. PYLES, Colorado Springs, Colorado.

Direct examination.

By Mr. DAWSON:

I reside in Colorado Springs, Colorado, and at present am engaged in publishing a newspaper and doing job printing. I have lived in this locality about twelve years. I resided in Kansas, at Garden City, in 1887 to 1889, I think only two or three years at that place, and during my residence there I observed the Arkansas river at Garden City and down as far as Dodge City and west to the
2864 Colorado line frequently, and there was more water in it sometimes than at others. I have seen the creek full to the banks often, but ordinarily it ran pretty low throughout the summer time—two inches deep and maybe a quarter of a mile wide—and then later in the season it was practically dry. You could walk all over it or across it. I have driven across it often. You could walk across it. You might have to jump a little puddle now and then. No running water. This would be through perhaps two or three months in the summer. Maybe longer than that. And this condition prevailed during each of the three years I was there. I think I could not state as to the time of the year. Since living in Colorado I have resided at this point for the last ten years. I was up in the mountains a few years. I held the office of water commissioner for six years here. Eight years ago next spring was my first appointment. Probably 1895, in April—1895 or 1896—and for
2865 six years thereafter. My duties as water commissioner took me along the Fountain all the time in the summer. I covered that stream to the Pueblo county line and about six miles into Pueblo county, from here. That would be perhaps thirty-five or forty miles of the stream, and then up the stream from Monument creek to Palmer lake. That was the district. During the performance of my duties as water commissioner I have observed but made no particular study of the subject of return waters, nor of measurements. I can state the practical action as to the stream, illustrating it, perhaps best, in this regard: Number 6 ditch is one of the older ditches right below town here and about four or five miles below the city. It has a priority of thirty cubic second feet. It often takes all the water in the stream when the stream is low. Within half a mile below where this ditch takes all the water there would commence to

be running water in the stream; and about eight miles below is No. 5 and No. 8 ditches, close together. We have the decree of No. 5—about 9 feet of water. At such times as I speak of when this No. 6 ditch takes it all there would be perhaps five or six feet for No. 8 in addition to the decree for No. 5—one half, perhaps. No. 5 would
2866 be taking about nine feet, I think. It is eight and a fraction. Then there would be from five to ten feet for No. 8. There were no tributaries in the way of natural streams coming in between the point of the first ditch named and the two last ones. When I speak of feet I mean cubic feet per second of time. In following the creek I have noticed visible evidences of waters coming into the creek from lands that were under irrigation. In going down the stream the first one here opposite the Beaver ranch is No. 10 ditch, and No. 10 ditch is above No. 6. When they are irrigating, and most of the time through the summer—because No. 10 runs water all the time—there are four to six feet—four feet I have measured—coming in at one place. That is, there is an old creek bed comes around and all of the seepage water runs into this. Seepage from the lands irrigated comes into this stream and comes in a body there. At times I have measured four feet of water at one place. That much was visible. And at another point, I suppose it is six miles below that, there is water running into
2867 the stream, enough to be running from the ground, a distance of thirty yards, perhaps, at one place, so that water crests form there, and it takes running water to make that, along the bank. From there down the stream along to the Pueblo line water comes in in two places visibly. At the lower end of the county I have seen more water at times, not all the time, than there was passing here,—twice as much. But that would not prevail the season through. We use the water between here and the Pueblo line five times, if there is water. In the later summer I think the flow is about equal on the lower stream and the upper one. When there is more water at the lower end it is probably a week or two or three weeks after there have been heavy rains up here and the water has not only run down—the creek will be down but the water on the land
2868 coming in is used up here. The taking out of water from the river on the upper reaches of the stream and distributing it upon the lands unquestionably increases the flow farther down the stream later in the season. I got that by deduction, from the fact that at points where there is no land irrigated along the stream where the water is very low the stream is dry. There is dry sand. You could drive up and down and across it. Opposite irrigated land usually at the lower end of this irrigated land or just below it, there would be running water in the creek again. To illustrate: In taking the water out for No. 6, take it all and there is water enough for No. 5. No. 5 is below No. 6. When we take it all out for No. 5 and adjacent meadows irrigated by No. 5, No. 19 ditch gets water at that time when No. 5 takes it all, and it is not over a mile and a half below, but it is directly opposite the meadows. And then the creek will be dry again

through a woods that must be three or four miles long, maybe more. I mean the bottoms not irrigated. There is timber growing on the bottom land. No. 19 I mentioned, I don't know how else to describe it. It is just below No. 5. It is meadow. It carries its water three miles, I presume, before it is used, or two and a
2869 half miles. All along there the creek is dry. Opposite the meadows irrigated by No. 19 is No. 13 ditch, and it has a head of four or five feet of water. I have always supposed—and I think it is right—that this water comes from the meadow that is irrigated by No. 19. Not from the surface flow, however. But there is a little strip of woods, perhaps a hundred yards wide, between the meadow and the creek, and there is no water running over the surface. It gets back to the creek by seepage, by a flow underneath the surface. Below No. 13 the creek is dry again for two miles. Just below the meadows irrigated by No. 13, No. 9 has a head of water. There are a number of ditches between those two points that get no water at all. The lands irrigated from the Fountain and its tributaries are so situated that their drainage is back into those tributaries, or the Fountain, and they are all close to it. I think the extremity—the outer edge—of the farthest farm
2870 from the creek would not be over a mile or a mile and a half, and most of them are within a mile. The outer edge of the farm, I mean, where the ditches go out, often the inner line of the irrigated land borders the creek. It comes right up to the creek, many of them. Of course there is a little strip of woods perhaps twenty or thirty yards wide. Most farms have that right along the stream.

Cross-examination.

By Mr. ASHBAUGH:

The sources of the waters of the Fountain are in the mountains here—the drainage from the mountains. There is a little tributary coming into the Fountain right here. It runs up to Palmer lake. It is Monument creek. The sources of Monument creek are the mountains on one side of the creek and a little valley. It is not very wide, simply a narrow water shed.
2871 Palmer lake drains north and is right on the water shed. The Monument reservoir is at Monument town, about a mile this side of Palmer lake. It is supplied from Monument creek, which is dammed and is supplied by the mountain drainage from Palmer lake down. The Monument reservoir
2872 opens right into pipes, and the overflow or spill-way goes into Monument creek. When the water is taken out onto irrigated land I think it unquestionably comes back; otherwise we would not know how to account for this water that continually comes into the creek. I have never made an investigation of that fact. I don't think that it necessarily follows that the seepage goes to a bed rock through which it cannot go, because the lay of the land would

make it drain that way without reference to the bottom. I have never investigated the question of the seepage having a current, but it would have to move, certainly, and move down. I have
2873 no idea at what rate of speed. I could not even guess how long it would take water put on irrigated land one mile back from a stream to get back into the stream. I would assume that the water would get back into the creek within six months here along
2874 the Fountain; but that is only a guess. When we put water on land along the Fountain, part of it evaporates, part goes into plant life and part becomes seepage. I believe the absorption by crops is greater than the evaporation. I couldn't say what part, however, went into each of these two items. It would be a guess. I should think that more than one half of the water got back
2875 to the creek. That would be a pure guess. If thirty feet of water was used in the upper ditch once it might be somewhere near correct to say that one half of that evaporates and goes into plant life, but I don't know how to divide it from that on down, because all before this, as I told you, big ditches were irrigating on both sides of the creek. We give to two ditches about ten miles below there about twenty feet of water at such times, but I don't
2876 know whether that is the same water or whether it comes from other sources. I have said that we have water in the creek. I say that at points on the creek it comes in. I said at that time I did not know whether it was the same water or not. I don't know that the water that comes in below is the water that used to be above, used for irrigation, and I don't think anyone could know that. The natural assumption is that it would be, there being no other source of water. If I had to give an assumption also I think that at least one half of it would get back; but that is purely
2877 speculation. If one half of the thirty feet used the first time should get back there would be fifteen feet of that water; then the second time we used it seven and one half feet would get back, if you took that hypothesis, and the third time about three and three-quarters feet, and each time we would use up one half of it in evaporation and plant life. If you take that hypothesis it would be true, but I don't testify to that. If about one half of the water used for irrigation is evaporated and used in plant life, and if we use this water five times over, the fifth time there would be but very little of the original thirty feet to be used, on that hypothesis.

2878 When I was in Garden City in 1887 to 1889, they were using water for irrigation a little in the valley at Garden City and up at Deerfield on the bottom lands. It was through the summer time that I observed that the water was very low in the river. I could not locate the months, but I think in July the water was down. There was water in the river in the springtime, and it was often bank full, and would be from four to five feet deep from one bank to the other.

2879 Redirect examination.

By Mr. DAWSON:

In saying there was a certain amount of water deemed seepage in the lower reaches of the stream, I think it came from water used earlier when all these great ditches irrigated their immense acreage there. No. 29 ditch irrigates two thousand acres, I think, and they use the most of the water early in the spring, commencing in March, and that is when there is the most water in the creek, during the early spring months, and it is then that these lands above are all irrigated. I would not attribute the seepage or water returning in the stream below the ditch all to the thirty feet then being taken out because, as I stated at the time, about half a mile below
2880 the head of this No. 6 ditch there is water in the creek again, and that water that was being taken out at that time was being carried a mile before it was turned loose. There is water above any point where the No. 6 water is spread, but No. 10 laps onto that and No. 29, the big ditch.

2881 A. Z. SHELDON, Colorado Springs, Colorado.

Direct examination.

By Mr. DAWSON:

I live in Colorado City, Colorado, and have lived in this locality nearly forty-five years. I was engaged in the business of surveyor or civil engineer for forty years, about, and was only once on the Arkansas river in Kansas. I think it was in the latter part of May, 1860, but I forget whether it was east or west of Walnut creek, but my impression is it was west of that creek several miles, some distance west of the Big Bend. The condition of the Aakansas river as to water at that time was quite disappointing to me. I expected to find a live, flowing stream, instead of which I found a bed of sand with places where the water seemed to be flowing a little, but I could walk across the river without getting into water at
2882 that time. I was only on the river a short time. We camped some distance from it, and two or three of us went down to get water for our cattle. It was only half an hour, not to exceed that, on both visits. We followed the stream up along the old trail or road, which rarely approached very nearly to the river. The nearest point that I remember was at the Big Timbers. I don't think I went to the river on that occasion. I don't think I saw the stream until I got to Pueblo. That was about the 28th day of June, and I found a nice stream of water there. There was apparently more water there than at the stream where I first struck it. I
2283 meandered this stream for the Government in 1869, I should think some thirty miles below Pueblo. I meandered the stream nearly to the mouth of Sand creek, and platted a map of it.

Sand creek is somewhere below Fort Lyon—below Las Animas. I think it was sometime in the summer, about the last of June, that I did this work. There was water enough then in the stream to irrigate half of Kansas. It was high water over the banks. I attributed this high water to the melting snows in the mountains. We had several very heavy showers while I was there, but the body of water in the stream was such that all we got from these showers didn't seem to affect it materially. The river, however, was an immence body of water at that time. I had no knowledge of the rainfall farther west in Colorado or along the mountains. I think I had
finished up my work somewhere near the first of August. It
2884 was in the early part of June.

I have been familiar with Fountain creek for forty-five years, I might say. I surveyed a large majority of the ditches on that stream, and I farmed about thirty years along it, and I took water from the Fountain. I made the Government survey of this country between here and Pueblo in the summer of 1863, and during that survey I found the lower part of the stream very much in the same condition in which I found the Arkansas river in 1860. The lower part was almost a continuous bed of sand, with an outflow of water here and there. I remember particularly that I walked several miles in the bed of the creek without moistening my boot soles with
water. I returned to Colorado City and measured the volume
2885 of water there and found 2,200 inches, running at the rate of
sixty feet per second, and I conjectured that the Fountain was a sort of index to all other streams in this arid country in the same conditions. In the course of my farming experience I observed that about one-third to one-half a mile on my farms along the bluffs adjacent to the stream there were springs flowing. Before introducing the water onto my ground those bluffs were as dry as the grounds, and these springs would continue to flow after I had ceased irrigation until late in the winter, and that excited my attention and I commenced making observations generally until I became fully satisfied that by pouring water into the ground we were constituting a reservoir for supplying the stream. In fact I was thoroughly convinced of that, so much so that at my own expense, several miles east of here, having a successive number of sink holes, I made a survey for a ditch through which to pour the water into those sink holes when we were not using it for irrigation, and I was fully satisfied it would afford a reservoir for the storage of water during the following season; but for the want of necessary capital,
and a proper interest on the part of those interested in the
2886 matter, nothing was done towards such a consummation. I
don't think I am prepared to testify definitely as to the flow in the lower Fountain since irrigation has been generally practiced above as compared to what it was before irrigation was largely practiced on the upper stream. I merely observed far enough to confirm my theory that the water could be stored in the ground, and proceeded no further. Neither am I prepared to testify as a matter of

direct observation what effect the irrigation of large tracts of land adjacent to a stream would have upon the regulation of the flow of that stream, if any. My observation would certainly confirm that the taking out of large amounts of water when the stream was high would affect the stream below when the water was naturally low in the stream. I saw springs running from the banks adjacent
2887 to the stream, which were received by it, and the supply of water would be enhanced to that extent. It depends entirely upon the ground as to how long it takes for the water to return to the stream. There are some formations through which the water will find its way quite rapidly; there are others in which it will be retarded, and where in one case a month or six weeks would be sufficient, it might take five or six months in another.

Cross-examination.

By Mr. ASHBAUGH:

I saw the river down near Great Bend only once, and of course do not know its condition at any other time. I know that during the latter part of the year 1859 and during all of the year 1860 there was a drought all over this part of the country. From 1859,
2888 I remember, to 1860, was a very dry year in Kansas. As against that, before I reached the Arkansas river on this occasion I encountered one of the heaviest rain storms I ever experienced in my life. I meandered the stream down to Sand creek in 1869, beginning on the western boundary of the Indian reservation. I estimated that to be about thirty miles below Pueblo, and
2889 I meandered the stream from this point to Sand creek. I undertook to trace the boundary of the stream. Of course the stream was devious in its course, and whe-ver I could find a line of sufficient length along I surveyed that line. Where I could not I would survey a base line and make offsets to the stream. Where the bank was submerged or any object was available, instead of measuring it, it being inaccessible, I would triangulate it and take the distance. When the Indians were removed to that reservation there was an allotment to certain half-breeds of a section of land to each individual and I was designated to survey these lands
2890 along the margin of the stream. Of course that made it necessary to meander the stream to get that part of the boundary line. I surveyed these lands in 1869 for the Government and my instructions came from the United States Government. To that extent I understand as a surveyor that the Arkansas river through this part of Kansas is a meandered stream, and I understand what surveyors mean by the term "meandered stream." The Arkansas river through that part of Colorado is a meandered stream, so far as territory is concerned. I suppose this is a matter of record with the Government. Of course in all my surveys I made the ordinary surveyor's return to the proper Government officers.

Examination by Mr. CAMPBELL:

2891 The Indian reservation I spoke of was made for the Arapahoe Indians in the early history of Colorado as a Territory. I had special instructions with respect to surveying the lands in that reservation along the Arkansas river and the meandering of that river was in view of those special instructions. A surveyor, under the general instructions given to United States Government surveyors, has to make a note of the fact of his touching any point of a stream, describe the stream at the point of touching it, and wherever he touches or describes it he is required to describe the points at which he reached the stream and the distance at which he left it. This was a peculiar survey. In ordinary surveys, unless it is a navigable stream or something of that kind, they are crossed, and the Government sub-division is carried across. In this case a part of the boundary line of the Territory was the stream itself, so that it became necessary for me to meander it and describe it faith-
2892 fully. The meandering of a stream is not an object but merely a necessary incident of the survey. That stream was navigable when I meandered it. There was water enough there. I have described the condition of the stream. But that was not its normal condition. It was never considered navigable at the point where I meandered it, in its normal condition.

2893 JOHN R. SITLINGTON, Colorado Springs, Colorado.

Direct examination.

By Mr. HAYT:

I reside in Colorado Springs, Colorado, and have lived in El Paso county about thirty-four or thirty-five years. I am sixty-five years of age, and have been a stock raiser and farmer up until the present time, when I am not doing anything. I am acquainted to a certain extent with the Arkansas river. I first saw it in 1870. I
2894 was with a herd of cattle coming from Missouri, driving them to Colorado. I struck the river at the Great Bend of the Arkansas and followed it from there up to Pueblo. I think that the Great Bend referred to and the town of Great Bend are about one and the same place. It was the last of June or the first of July when I made this trip. I had one hundred and fifty head of cattle of my own; there was about a thousand head in the bunch. I got to Chico basin about the last days of August. Chico basin is fifteen or twenty miles north of Pueblo. I was in sight of the river up from Great Bend most of the way. We camped on it every night. Not every
2895 night, but we would be right on the river. We watered the cattle from the holes along the Arkansas river. Sometimes there would be running water and again for miles there wouldn't be any in sight. There was a scarcity of water in the river. There was not a great deal. Sometimes there would be for a mile or two at a

time that there would not be any in sight, then there would be holes where the current when the river was up had washed them. There would be holes of water standing there. The farther up the stream we got—when we got up about Fort Lyon and along through that country there, and Rocky Ford, there was no water in the river, but the farther up the stream we came the greater the supply. It was some place through the section of the country around Rocky
Ford that the holes occurred in the river. There was con-
2896 siderable more water at Rocky Ford, and considerable more
at Las Animas even, than there was at Dodge City. We made about eight to ten miles a day on that trip. I saw the river in 1871 at about the same point. I was in the same business—driving cattle. It was somewhere in July, I don't remember the dates, and we passed over practically the same ground. I made
the same trip right over the same ground in 1872 and found
2897 the conditions just about the same, and in about the same
months. We had no difficulty in finding water for the stock, because we made it a point for some men to go ahead and hunt up these places and have our regular camps picked out. We would camp where there was the most water. We had quite a bunch of cattle. I don't know as it was quite an object for a person driving cattle to find water, but we generally tried to find where the water was running in the river. I have seen these dry stretches for a
mile or two where there would be no water on the surface at
2898 all. This was rather a frequent occurrence down on the
river. I didn't notice any difference in the flow of the water in the river with reference to the hours of the day or night. I have seen the river frequently since that time as low down as the state line. I have not been below the state line, only on the railroad, since then, but I have been that far frequently. I have farmed on the Fountain. The first years were in 1885 and 1886. My ranch was located sixteen miles south of here. I believe it was about twenty-seven miles from Pueblo. I was stock raising at that time, and farming, both. I lived here in 1885, then I was away for a time, and in 1890 or 1891 I bought the farm and lived there for
ten or twelve years, up until last fall.

2899 We contend that we have more water in the Fountain the
last few years than we had previous to that time. I believe that is true as a matter of fact. There is decidedly an increase in the flow of the water, in the amount of it, in the creek. I don't know as I can give the dates in regard to when I first noticed this, but it was a year or so after I bought the farm that I could notice quite a difference in the amount of water in the creek and it has been increasing from that time to this. I think there has been a great deal of increase in the flow of the water.

Cross-examination.

By Mr. ASHBAUGH:

2900 I don't know that there has been any decrease in the snow fall in these later years. We have had but very little snow fall here in the late years from some cause or other, but I don't know whether it is decreasing or not.

I came up the Arkansas river on three different occasions along the Santa Fe trail, but whether the Santa Fe trail runs down
2901 to Kinsley or not, I can't say. I don't know where Kinsley is. In our cattle driving I didn't follow the old Santa Fe trail. I couldn't tell anything about that. The country was not settled up and there was nobody living in the country and I went where I pleased. That was the most convenient time in the
2902 year to drive our cattle through. I did find high water in the river during my trips down there, but I don't know whether there was any high water in the river at any time during the year. I didn't see any. We were on the river about two months a year. There might have been high water during the ten months and we not see it. I don't know as to the condition of the river
2903 at other times than during the two months when we were on the river with our cattle. I have heard this contention—that there was more water in the Fountain for eight or ten years. Two reasons are given that I know for more water being
2904 in the Fountain. One of them is the irrigation and the other is that the water is being stored above and held back. I couldn't answer the question as to what proportion of the water that is used for irrigation becomes seepage water and gets back into the river again.

2905 THOMAS SHIDELAR, Colorado Springs, Colorado.

Direct examination.

By Mr. HAYT:

I reside at Colorado Springs, and have lived in El Paso county about thirty-five years. I am seventy-one years of age and most of this time has been spent in office work. I have been justice of the peace here, police magistrate, and water commissioner. I was water commissioner of district No. 10 for six years, from 1886 to 1892. El Paso county was embraced in this water district. My duty was to distribute the water to the ranchmen according
2906 to their priorities. I was familiar with the Fountain in the early '70's—1871 and 1872. I have been over it several times from here to Pueblo. I was not so familiar with it from 1871 to 1885. About 1870 and 1871 I was most familiar with it, and very little after 1871 and prior to 1885. I don't think I was along the river during those years. I have been pretty familiar with it

since 1892. From 1885 to 1892 I was very familiar with it. I saw
it pretty nearly every day in the summer season from March
2907 to September. My duties required me to go up and down
the river nearly every day. I travelled over the entire reaches of the river in El Paso county during those years frequently, from Palmer lake to the county line south and up the Ute pass to Woodland park and the lake. There has been a good deal more water in the Fountain river during the last years than there was during the first. I noticed this increase first after Colorado Springs was located and they got to irrigating here. I think that was in 1871, but the flow did not increase for several years after that. They didn't irrigate a great deal at the beginning. The flow has increased—take it from 1888 and from that time on—every year more or less. I attribute this to the ditches being taken out along the creek, and the irrigation. The water taken out in these ditches goes back to the river underground. It is what is commonly known as return water.

2908 Cross-examination.

By Mr. ASHBAUGH:

I don't think that all of the water that is taken out for irrigation becomes seepage water and flows back into the creek. Part of it, of course, goes into evaporation. There is not as much gets back into
the creek as there is taken out. I know that a good deal of
2909 water must evaporate in the use by irrigation and be taken
into plant life. If a plant were plowed under ground, then some of the water taken into that plant might get back. Some of it. The plant before it was plowed under might become dry or it might not. If it was plowed under to manure the ground it would be dry. The amount of water taken into the plant comes nearer being evaporation than seepage water. I don't think the water would be destroyed. It would go some place; I know that.

2911 CAÑON CITY, COLORADO, December 13, 1904.

DALL DE WEESE, Cañon City, Colorado.

Direct examination.

By Mr. DAWSON:

I reside in the suburbs of Cañon City at this time and have lived
in this general part of the country about twenty years. I
2912 have been engaged principally in constructing irrigation
canals and ditches and in reclaiming land and planting it to orchards in this vicinity and in Garfield county, and for the twenty years I have taken a general interest in irrigation matters and the reclamation of land by irrigation, in fact I have done nothing else. Lincoln park is in the neighborhood of Cañon City and on the

south side of the Arkansas river, and before it was put under irrigation it was known as a mesa, covered with cactus and sage brush, and was flat. There were no crops raised by cultivation grown upon it prior to irrigation. It is not possible to raise any
2913 crops successfully in that locality without irrigation. I built the extension of the South Cañon ditch from the top of the hill on to the southeast; then I was the builder of the De Weese ditch and reservoir company's ditch, and have reclaimed some eighteen hundred acres in Lincoln park. Ninety per cent. of this is orchard and ten per cent. alfalfa, and it has been about eighteen years since the first of it was reclaimed, and it has been four or five years since the last of it was gotten into crops; that is a very small per cent. of it. Lincoln park lies about one hundred and twenty feet above the river. The break-off from Lincoln park is very abrupt. The soil is from eight to sixteen feet deep; then comes a
2914 gravelly stratum of twenty to thirty feet, and from that on to a shale. The break off is commonly called a bluff. It is very steep and straight-off. There are three gulches or arroyos running through this land, to the south and east of a good portion of that brought under irrigation, and I remember in 1885 when I built my house and corrals, at the lower end of the park half a mile above the lower end of this first gulch through the cañon, I noticed in February the ground would be a little moist in one place or two and I thought it might be possible for me to get stock water there. As it was, I had to build a cistern up at the house and had been watering my stock there. There was a gentleman living next place to me that had about ten acres—Elliott McRae of Cripple
2915 Creek. I suggested that we dig a well there. We started to dig and went only two and a half to three feet and had water, so we put in a barrel and used that for stock water. We would turn about and go down and dip the water out for them that winter. That was in the winter of 1884–5. I came there in the spring of 1884. That same season I extended the ditch to within half a mile of this spring as we called it, and the next season the water ran out of this barrel, one year after the time we first set it out. When we extended the ditch we placed lands lying immediately higher than the spring under irrigation—higher by half a mile. The ditch was half a mile up the hill from this barrel. Within four years there was at least from one to two cubic feet of water per second running from that spring. During the last four or five years there has been from three to five cubic feet of water running in it, in fact I had surveyed it in and have worked hard to try to work that water out on some land, but the land was rough and broken and it would have to go through a sand and gravel stratum for two or three miles and it would necessitate the cementing or lining of the ditch and fluming it, so I didn't think it was prac-
2916 ticable. There have been two parties living on the bank of the river just under this mesa, lower down, that have had a ditch out of the Arkansas river four or five years. They have aban-

doned that almost entirely, doing nothing other than just to keep it open a little to claim their rights in the stream and have appropriated and used this water out of this spring gulch on their lands that is, in the first gulch. The flow from it has been constant and does not stop in the winter. It seems to run more the first two or three months after the ditches are shut down, that is to say, in November, December and January. This water from the irrigated lands goes under ground. There is no stream, no irrigation ditch heads into that to cause the water to run from that particular point. It
2917 is simply sub-irrigation. There never was any flowing stream in this gulch to my knowledge prior to the time of irrigating this land. The other gulch is over in what is called Davison's gulch, half or three-quarters of a mile farther to the southeast. It comes out of the little foothills over near the Brookside shaft. I never saw any water running there myself prior to this irrigation. In the gulch I have just described I didn't see it before the lands were put under irrigation. I know it was not a regularly flowing stream before the time of beginning irrigation. There is now
2918 there from two to three cubic feet of water in that gulch, flowing regularly. The lands which are irrigated and which would naturally drain toward this gulch come right up to it, in fact this De Weese ditch terminates now at this gulch. The water is not carried over the surface. Allow me to explain there: This might be something that would give the wrong impression. I don't mean that the terminus of this ditch has been at the head of this gulch all these years. It was never extended there until two years ago, because we would have absorbed and used all of the water in the ditch before any could get to the end of it. The water that has appeared of late years in this last gulch has reached there by percolation through the soil. There are no other gulches that show the effect of irrigation, but I can say that all along this break-off
2919 or bluff from fifty to eighty feet below the crest line or top of it there are little springs coming out in intervals of a hundred or two hundred yards, but they didn't exist prior to the irrigation of the uplands. And there are no sources of supply so far as I can determine for the water which of late years has been running in these gulches and coming out along this river bluff other than the irrigation of the lands lying above, and this seepage water finally reaches the Arkansas river. This observation has been general as to the effect of irrigation. I can say that I have seen the same thing in Delta, Montrose and Garfield counties. In Garfield county where I have just completed the other ditch we have the same con-
2920 dition. Taking it by the year, and one year with another for a series of years, I would think there would be a depreciation of probably thirty per cent. of the volume of water in the stream, but it would cause a more regular flow. That is to say, for reasons I have just explained awhile ago, by irrigating this mesa land in the summer this water in the gulches continues to run all winter and imparts water to the Arkansas river again which, if it

had been used on these lands, would have gone down the river in the flood times. The use of water copiously in the early spring upon the land has a regulating effect upon the stream. I
2921 have seen all of our irrigated lands in the United States. I have travelled these States and Territories over for twenty-five years. I have seen it in India, in Egypt, in China and in Japan, and without irrigation none of them would have anything. That is about what it comes to. Irrigated land is more productive per acre, that is, well irrigated lands with an adequate water supply, because the moisture can be regulated. I know that is the case particularly in the foreign countries, in the Orient, where they understand irrigation. We are not in the alphabet in irrigation. We don't know anything about it compared with China and Japan; and I saw evidences there, when it comes to the construction of dams and ditches and reservoirs for the storage of water, that would make an American want to get a flying ship and get home to pick up some of these snaps that there might
2922 be over the country here when we see what they have done to reclaim arid lands and make them productive. There is no question but that in the arid regions of those older countries where the land is properly irrigated they support a much larger population per acre than in almost any other region in the world. From my practical experience and observation in regard to irrigation matters, as to the effect upon the arid portions of the United States if a doctrine were established which prohibited the use of any waters for irrigation upon those regions, the first year there would be a loss of about fifty per cent, the second year seventy-five
2923 per cent, and about the third year it would wipe us out—ruin us. If irrigation were prohibited here the irrigated region would revert back to a worse condition than it was in before it was commenced, and it would only be good for a stock ranch. You might put a fence around Colorado and call it a stock ranch, or any other State. The irrigated lands I have spoken of in Lincoln park and on the north side of the river near Cañon City where planted to orchards at the present time are worth on an average of $500 an acre, owing to the condition of the orchard. Orchard lands have paid ten to fifteen per cent. on the investment; that is to say, orchard land here eight to ten years planted will net from $80 to $100 an acre. It has done it under good management. This is for an
2924 average of years. That is, for orchards of that age. Special yields in particular years have reached to the extent of $300, $500 and $600 an acre in the extremes under good management and under the best conditions. None of this orchard land can be successfully farmed without irrigation. All of the shade trees and all manner of vegetation in the town of Cañon City is kept alive by irrigation—by ditches along the sides of the rows and water kept running in the summer. The trees would not continue to live only along the river bank without it. We have evidence of that all throughout this entire arid country. Before the settlers came and

before the water was taken out in ditches for irrigation there were no domestic trees such as the cottonwood or cherry or the maple or the box elder and locust—which are the only varieties of eastern domestic trees that grow here naturally—aside from the conifers, that is, the pines and evergreens. They grew here from the earliest times. If it had been possible for others we would have had
2925 them growing here. There is no agriculture possible without irrigation, and the land is worth only from $1.50 to $12, owing to the proximity of the land to a man's house and barn, where he would want to fence them in for the little grass that grows naturally or for the gramma.

Cross-examination.

By Mr. ASHBAUGH:

This land through here back to the mountains or foot hills before irrigation is what we call arid lands, and this extended down
2926 to the edge of the river. The cactus and sage brush I spoke of originally extended down to the river bank.

I am not prepared to say what the average flow of the Arkansas river through Cañon City is for the last fifteen years. The source of the Arkansas river is to the northwest of here, in the mountains, and in the mountain streams about the Sangre de Christo range. Above Cañon City irrigation is continued to within five miles of Leadville and extends back from the river from half a mile to four miles on either bank. I should judge that when water has been put upon the land for irrigation from twenty-five to thirty
2927 per cent. of it becomes seepage and finally returns to the river. Some canals run back to a distance of five miles from the river. I should think that water that was spread upon the land for irrigation back five miles from the river would reach the river again in from one to five years. It might go a mile a year, depending largely on the conditions underneath. In gravel it would be more rapid than in clayish soils or shales. In shale it might take it ten years. I think a mile a year would be reasonably high for the rapidity of the flow. I do not believe this flow is as rapid on the north side of the river as on the south side of the river where
2928 there is adobe land for it to go through. The loss that is occasioned is caused by evaporation and the absorption by vegetation in plant life, and the seventy-five per cent. would be used up in the soil and by vegetation and evaporation. Evaporation is quite rapid sometimes, particularly below five thousand feet where the sun is hotter and there is more wind. This also depends a good deal upon the land. The heavier adobe lands have greater evaporation than lighter, sandy land. Sandy soil retains the moisture longer than other soils. A long, dry season with bright
2929 sunlight will evaporate more than a short, wet season with fog. Nobody is able to state the exact percentage of water that is lost, and this amount cannot be determined with

positive accuracy, and it must rest in the judgment of the best experienced men and of the longest and keenest observation. I think there is as much as thirty thousand acres of land here that is worth $500 an acre. This is in bearing orchards and they are from five to twenty-five times more profitable than agricultural lands. Small fruits are very profitable here. Strawberries and raspberries are the best small fruits. There are a few acres here confined entirely to the strawberry culture. We plant our land here to orchards with the rows about two rods apart, and while the trees are young they grow strawberries and vegetables and small fruits in be-
2931 tween until such time as the orchards are from eight to ten years old and in bearing. We have been able to develop alfalfa here to the extent of five tons to the acre for three cuttings in a season, which is worth on an average from $5 to $7 per ton in the field and from $8 to $10 delivered. With the three cuttings I don't include a seed crop. I think irrigation is indispensable everywhere where it is an arid country. It is just as important for others to have water, however they use it, as for us to have water as we use it. Of course crops can be raised in Ohio without irrigation,, but you can't raise anything without water anywhere.

Examination by Mr. CAMPBELL:

2933 Yes, I said that irrigation in this country was in an imperfect state in comparison with its development in Egypt and China. In India they haven't got as far along as we have. It is a fact that improvements and progress are being made every year in irrigation in this country, and the duty of water is increasing every year here. If irrigation had progressed to the same point in this country that it has in those countries mentioned the increase in percentage of lands that could be irrigated with the amount of water we now use would be about sixty per cent., I think. It is possible to develop irrigation systems in a limited territory in this country to reach that stage of perfection that exists in Egypt and China. It would never be extended as they are, because we haven't the water supply.

I don't know what the assessed valuation of this (Fremont)
2934 county is. Assuming it to be over six millions of dollars, about eighty per cent. of this valuation has been created by and is dependent upon irrigation, and were it not for irrigation this would be valueless in three years, that is, from an agricultural and horticultural standpoint.

Redirect examination.

By Mr. DAWSON:

2935 There are some six thousand acres of land under irrigation around in the little valley immediately surrounding Cañon City. Cañon City and South Cañon and the immediate suburbs

within a two mile limit from the postoffice contain about ten thousand inhabitants, and in my judgment about ninety-eight per cent. of this number are dependent upon this irrigated district around Cañon City.

Recross-examination.

By Mr. ASHBAUGH:

We do not count the mines of very much value in this immediate vicinity, because we haven't any. We have some valuable mines here, and if they should be sustained and there was no irrigation the supplies would have to be brought in here. There is nothing
2936 that is paying here in the way of mines, other than the coal mines, within thirty miles of us. These coal mines have their own towns and stores about the mines and are not dependent on Cañon City.

Examination by Mr. CAMPBELL:

Yes, I testified in respect to evaporation, and in that connection stated that it depended upon the soil and winds and one thing and another. This evaporation depends to a large extent upon the time when the water is used. For instance, if you irrigate a piece of land in the middle of the day when the soil is hot and parched and the water warm the evaporation would be greater than if you took it out earlier in the morning or at night and applied it to the soil when it was cool. I am not prepared to say what the difference in percentage would be. Within the vicinity of eight or ten miles of
2937 Cañon City there is nearly half a million dollars invested in irrigation plants exclusively.

2938 C. J. FREDERICKSON, Cañon City, Colorado.

Direct examination.

By Mr. DAWSON:

I live in Cañon City, and am the county treasurer of this county. I formerly lived in Kansas.

The assessed valuation of Fremont county, in which Cañon City is located, for the present year, 1904, is $6,492,744. I just took it off my records. And this valuation is supposed to be one-third of the actual value, and I think from my own observation and knowledge that that is true.

2939 J. S. LOGAN, Cañon City, Colorado.

Direct examination.

By Mr. DAWSON:

I am sixty-six years of age and reside in South Cañon City, and have been in this locality thirty years in May. I was acquainted with the Arkansas river in Kansas in 1863 and 1864 at a point near Fort Larned. I was in the United States Army and stationed there at that time. We were there from either the last of April or
2940 the first of May, 1863, until about the 25th of January, 1865; along in May, June and July of 1863 the river was pretty high; the banks were full; but sometime in the last of August and September it was perfectly dry. The holes were all dried up and the fish were all dead and everything. There couldn't anything live. You couldn't get any water at all. This condition lasted some six or eight or ten weeks; I don't know just exactly how long. I saw the river again in 1864, during the summer and early fall. I don't think it was quite so high in 1864, but it was just as dry, and about the same in length of time, as in 1863, during August and September. It was pretty much through these two months, from six to eight weeks. There was no running water. That was
2941 about seven miles from Fort Larned. I know that General Baldwin passed through this locality in 1863 and 1864, but just which year I don't know. It appears to be in 1864. I was in the quartermaster's department and issued rations to him and feed for his stock. In 1875 I came up the Arkansas to here, but it was in the spring of the year. I was not on the river in the late summer or fall of 1865. There was not a very big flow of water at that time, I think about in April. We struck the river at Ellinwood. We came up in wagons. There didn't seem to be much difference in the flow of the river between the points from Great Bend to Coolidge in Kansas, and the river this side of the Colorado State line.

Cross-examination.

By Mr. ASHBAUGH:

2942 The river had a uniform flow clear down from Colorado to Kansas in April, 1865. There was always water in the spring for two or three months, along in the summer. That would last about six weeks. The river then would be bank full. Later in the season that would run down and the river would be dry. During the winter months of December, January and February there was a little running water, but very little. There was flowing water, but not so much as in the summer. My observation lasted from 1863, through the year, through to January, 1865. During the dry times of the year when there was no flowing water in the river there was

water in the river bed so that you could get it by digging.
2943 We dug there to get what water we used when we were on the river. I was at Fort Lyon in October, 1864. There was a little flowing water then. There was more than there was in the river below. It went under. It sank into the sand and flowed down there and we could get it down the river by digging.
2944 We dug at Fort Larned to get water sixteen feet, and Fort Larned is seven miles away on the Pawnee fork of the Arkansas. The old Santa Fe trail was about half way between the river and Fort Larned. There was a branch running up there. Where we dug the well at Fort Larned seven miles from the river and sixteen feet deep to water it seemed to me that we were
2945 pretty nearly on a level with the river. That is a very level, flat country. We dug the well in the very dryest part of the year and got water at sixteen feet. Of course the water raised—in the creek we dug but a little ways from Pawnee fork, it would rise in the well as the water rose in the Arkansas river. I don't think that the water level we struck in this well at Fort Larned would be below the water level of the water in the river, but would be just about the same. Of course we were higher, a little, at Larned than we were at the river, but then it is a level country and there is the fall of the country and I don't know what that is. As near as I could judge the water level in the well was about even with the water level in the river. I did not run any levels to find out accu-
2946 rately. This well was about thirty or forty feet from this Pawnee fork.

During the flood season I think the river would rise about three or four feet. I don't think more than that. It is thirty years since I saw it. The banks were very low and about three or four feet high.

2947 HENRY C. BECKHAM, Cañon City, Colorado.

Direct examination.

By Mr. DAWSON:

I reside in Cañon City, Colorado, and have lived here about forty-two years. I have been engaged a great many years in the range cattle business, and now I am practically in the cattle business, although not in the active work. I saw the Arkansas river in the '60's in Kansas—in 1862. I think we struck the river somewhere in the vicinity of what is known now as Great Bend, and from
2948 the point where we struck it I came to this place. We travelled with ox teams. My recollection is we came right up the river. I think we struck it in September. I left Westport, Missouri, on the 20th of August. The river at the point we struck it was practically dry. We could cross it on foot without getting wet. There was no running stream then, and I remember we didn't have

any trouble after leaving Great Bend about getting sufficient water for our stock. It was a small outfit. At Great Bend there was se-
rious trouble. We had to scoop out the sands with shovels
2949 to get water for camp, sometimes, and I think our cattle went
short of water there. We scooped out the sand to get water for ourselves. As we advanced toward this country the water increased, and by the time we reached Pueblo there was plenty of water. As I recollect it, there was a regularly flowing stream from the State line all the way to Cañon City. I don't think we had any difficulty in finding plenty of water. Since coming to Cañon City in 1862 I have been more or less familiar with the Arkansas river
at this point. In the year 1863 the Arkansas river was a
2950 running stream through the summer and fall, and in fact the
whole year, here at Cañon City, and that was also true in 1864. I have never known it to be dry, without a running stream, at this point.

Cross-examination.

By Mr. ASHBAUGH:

When the river was dry through a part of Kansas, we found running water in it above. As to where that water went, I suppose it was an underflow and that it went into the sand. When we scooped out the sand we didn't have to go far. It was very shallow. Probably a foot or possibly two feet. I can't say when irrigation began in the Arkansas valley in Colorado. There were some ditches in
this vicinity when I came here, a good many, both on the
2951 river and its tributaries, small ditches. That was in the year
1862. These ditches were small compared with what we have now. I couldn't say how long these ditches were. They were taken out of different creeks. They were just personal ditches to irrigate a particular tract of land, hardly a mile or two long, I think. Possibly not more than half or a quarter of a mile, and just covering the small bottoms along the creeks and as near to the river as they could get the land they wished to irrigate. These ditches were possibly two or three feet wide and possibly a foot deep at the deepest places. They would irrigate five or ten or fifteen acres, and in the aggregate they were but a very trifling percentage of what is now irrigated.

2953 JOHN PIERCE, Cañon City, Colorado.

Direct examination.

By Mr. DAWSON:

I have lived in this general locality since 1859 and was familiar with the Arkansas river in Fremont county in 1863 and 1864. We had a good stream of water running in it throughout both of those years. I have never known this river to be dry either in this county or in Pueblo county.

Cross-examination.

By Mr. ASHBAUGH:

The source of the Arkansas river is melting snows in the mountains here. I don't know what the average flow of the river
2954 is here. I never paid any attention to it. The river gets its water from both the snow and rainfall and from the drainage of the stream.

2955 JAMES A. MCCANLESS, Cañon City, Colorado.

Direct examination.

By Mr. DAWSON:

I am sixty-eight years of age and have lived in this county about four years and a little over, and about eight miles east of where we now are, on the Arkansas river. When I came to this country I came overland with ox teams. I struck the Arkansas river at Great Bend and travelled along it to this place. I struck it at Great
2956 Bend between the first and tenth of May, 1864. At Great Bend there was no water flowing at all. After we got up above to Pawnee rock there was a little stream running there, not very much. Then when we got up to the mouth of the Pawnee fork there was quite a little water running down. There was more water coming down the Pawnee fork than there was in the river, caused by rains, I suppose. As we came up to the Colorado State line and on west into Colorado the river increased some all the way up. I went down the river in the winter of 1866 or rather in the spring of 1867. I left here in February and went down along the river clear through to Great Bend and arrived there sometime in March. There was a little more water in it than when I saw it before. It was frozen over, so that we couldn't tell much about it. It was mostly ice. But there appeared to be more than when we saw it in
2957 1864. The town of Florence is largely built upon what was my farm or homestead, and it runs down along the river. So that since 1864 I have been familiar with the river at that point, and I have never known it to go dry so that there was not a flowing stream, although I have known it to get pretty low in the fall of the year. I couldn't tell how long we were in going up the river in 1864. We got here on the 29th of June at Cañon City, but we were water-bound by a flood that came on us at Sand creek below Fort Lyon. This was in May, 1864. Sand creek is in the eastern part of Colorado, about fifteen miles below old Fort
2958 Lyon. We were water-bound there some fifteen days, and the high water in the river lasted quite a while after that. There was a great flood in all these mountain streams. The river was very high up here at that time and lasted at least six weeks. The water was high all that year, from that time on through the whole season. There was probably plenty of water down in Kansas

after that flood. When there is flowing water in Colorado and the river about dry in Kansas I couldn't tell you where the water goes.

2959 I suppose it sinks in sand. I know we dug in the sand to get water at Great Bend and found it, and I suppose this must be supplied from the flowing water in the river. I couldn't tell, but we found water there. The only other source of supply is in Pawnee fork. I don't know of any stream that amounts to much above that until you come up toward the mountains. I suppose that this water that we found flowing in the river above does have something to do with supplying the water that we found in the bed of the river below. I don't know of any other supply for it.

The season of 1864 that I spoke of was a rainy season in this part of the country and along the mountains. From the time the flood struck us at Sand creek the water was very high all that year. When we crossed the Fountain at Pueblo it was very high. I don't remember whether it was any more rainy than common, however.

PUEBLO, COLORADO, December 14–15, 1904.

2961 JOHN ROSS, Pueblo, Colorado.

Direct examination.

By Mr. GREGG:

I am sixty-seven years old, and my residence has been at Boone until here lately. I have been farming and stock raising,

2962 and am still interested in the cattle business. I have lived in Colorado since the autumn of 1861; that is forty-three years. My family has been here in Pueblo two years. Prior to living in Pueblo I resided twenty-two miles east of here on the river and carried on farming and cattle raising there. I have lived on the Arkansas river all the time in Colorado, but I came up the Arkansas river in the spring of 1861. I was with a freighting outfit. We came on the Santa Fe trail to the Arkansas river and then up the river to Cañon City. We struck the river in Kansas not

2963 far from Great Bend. That was on the old Santa Fe trail. We followed it up from there to Cañon City. We were on the river every day. When we reached the river at Great Bend in 1861 it was dry; that is, there was just a little seeped water would rise here and there in it. There was no regular current,—no regular stream. We found it above the surface here and there, though. This was in the month of June. The best of my recollection is that it was about a hundred miles from there to where a continuous current was found flowing in the river. We were some six or

2964 seven days travelling up before we met with what you might call a flowing current. I came up and located at what is now called Boone or two miles east of that, twenty-two miles east of here, on the Santa Fe road. That is on the Arkansas river. We travelled somewhere about three hundred and fifty or four hundred miles

coming from Great Bend to Boone, and according to my recollection, for about one hundred miles of that distance immediately on leaving Great Bend we found only holes of water here and there, and this side of that we found the river flowing. I think we reached Boone about the second or third of July. We found no place on the
2965 river which we could not ford. I have been on the river in Kansas some, but not a great deal, but have been on the river all the time in Colorado. I think I was on the river in Kansas again in March, 1878. I drove down there with a wagon. We camped on the river most every night. The river was quite low. The river apparently was very low, but we didn't cross it until we got fifteen miles east of Dodge City, and there it was pretty wide but very shallow. It didn't appear to be more than two or three inches at the deepest. I went down as far as Kinsley several times. I had some stock down there for two years, but I don't remember the
2966 dates. It was generally in the spring of the year, though. My best recollection is that this was in 1879, 1880 and 1881—along there. I was there probably three or four different times. I had some stock down there, and it was along in the fore part of the year, in the spring, generally, when I went. When I went down there I made short trips. I generally went on the railroad to Kinsley and then went to where the stock was. We kept the cattle on the south side of the river, between Kinsley and Dodge. There was always more or less water in the river at those times between Dodge and Kinsley. It was generally low when I was there.
2967 You might say I have lived at Boone, Colorado, regularly from the winter of 1861 until the present time, as I still stay there most of the time myself. I have always been on the river. My ranch is on the river. The river usually commences to rise in May. It generally goes down about the first of July. In 1863 the river was very low—rather lower than usual. That was a dry year. There was not running water in it. In 1864 the river had an abundance of water. The whole bottoms were covered from one
2968 side to the other all summer nearly. The high water came from the excessive amount of snow in the mountains at that time. I think it was entirely from snow. There was a very heavy fall of snow in the mountains, very unusual, and there was some rain. In 1863 it was very dry. In 1864 there was some very heavy rains that made the river very high. I don't recollect that there was a great deal of difference between 1865 and 1868, on the average. I have never seen the river entirely dry at my ranch at Boone. There was always some running water. It usually
2969 got very low in the latter part of the summer and fall, however. I don't know that there was a great deal of difference in the flow of the river through the latter part of the summer and fall at the time we usually call it the low run, between the very early years of which I have spoken and the recent years. I am excluding drouth years. There were always some years when the flow was better than others, but I don't just remember the years. Taking it over a

large number of years, I haven't noticed a great deal of difference. In 1864 there was quite high water, and the years of 1865 and up to 1868 were simply average years. I never measured the water.

I couldn't tell, only that the river was generally, in the fall,
2970 quite low. Taking it along in July, the river would go down very low and remain so until probably in the winter. Of course sometimes it would be lower than others, but usually it always went down pretty low. Even in the high water years it always goes low in those months in the latter part of the year or winter. We took out an irrigating ditch—we had it surveyed in the winter or fall of 1861 and we had it in operation by the spring of 1863; that is, we did a little work with it before that, but not much. We took it out ten feet wide on the bottom and probably two and a half feet deep, and it was about nine miles long, and I should say it would carry seventy cubic feet, and irrigated in those days about three thousand five hundred acres of land. I am counting my land in with others that was irrigated from this ditch. During the early part of the time we were there we raised mostly corn, oats and wheat.

In later years we raised more alfalfa than anything else, and
2971 corn, and we usually have pretty fair crops. The head of the ditch comes out of the river about eighteen miles east of Pueblo.

I have some knowledge of seepage waters in the vicinity of Pueblo along the Arkansas river. (Objection.) There are a
2972 great many of these arroyos that have no names. They are only little draws that run in from the hills to the river, and most all of them between Pueblo—the Bessemer ditch runs into the Huerfano. Most all of them are running more or less water. The ones I am speaking of are right east of Pueblo here. One of the arroyos is called the Grand. I should judge it is about fifteen miles east of here. I passed over it a number of times when it was dry, but now it has a continuous flow of water in it the year round. I couldn't tell the number of feet. It flows very fast. But I have crossed it quite often in coming up here to town with a buggy, and sometimes go on that side of the river. I have crossed it when it would be four or five or ten inches deep, and probably ten, twelve or fifteen feet wide.

Cross-examination.

By Mr. ASHBAUGH:

2973 During the year 1861 we found the river dry from where we came onto it for, I should judge, about a hundred miles. We came up the river in June. June is supposed to have about as much water as any time in the river. There was no high water down there. I don't know how it was up here. We didn't get any here until about the first of July. The river was quite low here then. I don't know of any high water in the river that year.

2974 We found more water up the river that year than down there. In the years 1879 and 1881 I found water flowing in the

river between Dodge and Kinsley and went down in March and came back in April. It was generally along in the spring of the year, sometimes earlier and sometimes later. I went down in 1882, but I always went down on the train and just crossed the river on the train. In each of these years—1879, 1880 and 1881—I found flowing water between Dodge and Kinsley. I suppose there must be more water in the river up in Colorado than there is through Kansas when the water is low there. I suppose this water goes into the sand. I don't know where it goes, but the probability is it goes down into the sand.

2975 The high water that I spoke of in 1864 lasted through the whole summer, and I think that excessive snows in the mountains the winter before was the cause of it, and the melting snows that summer made the high water in the river. The name of the ditch that we took out in the fall of 1861 was the Arkansas Valley Irrigating Company's ditch. That ditch is in operation now and is now named the Arkansas Valley Irrigating ditch. There were other ditches commenced about that same time. The water in these arroyos must have come after—they never flowed any water until the Bessemer ditch was taken out. I can't tell how the water gets

2976 from the Bessemer ditch into these arroyos. People irrigating along. The water must go through the sand and find its way out into the break of the hills next to the river. I can't tell how long it would take seepage water that is applied to land two or three miles back from the river to reach the river. I don't know of any other source from which that seepage water could get into the arroyos of which I have spoken excepting the Bessemer ditch.

2977 GEORGE GILBERT, Pueblo, Colorado.

Direct examination.

By Mr. GREGG:

I am sixty-eight years of age and have been in the cattle business and farming for the last forty or more years here in Colorado, since the spring of 1861. I have lived in Pueblo or near there since 1863, and I have done ranching and farming in connection with the cattle and stock business. My farm is located about twenty-one miles east of Pueblo, and I had about five hundred acres. I owned it until recently I sold it. I am interested in the cattle busi-

2978 ness. I have been along the Arkansas river. I think the first time in the summer of 1879 I was on a cattle hunt. I don't know just how far it was east of the State line, but it was where the town of Lakin is, on the Santa Fe road. That is east of the Colorado line. I think it was in the month of July, probably. I was upon the river at that time, and found it was low. There might have been some very small running channels. There was one channel there, if I recollect right;

it was probably twenty feet wide, and the water might
2979 have been six inches deep in it. It seems to me there were a few smaller channels where a little water would run in low places. I have only been at that point once. We were three or four different days on the river before we got up to the State line. A couple of days maybe. I don't know the distance. And we found some water flowing when we went there. It was not dry. There were no floods at that point. The flood came down the river when we were farther up in Colorado. This must have been some time toward the last of July when we got there in 1879, I think.

The flood seemed to recede next day very much; it ran off
2980 quickly. As we came up the river we judged by the water marks that had been left that the water was falling very fast.

The next time I was in Kansas it was farther down, at
2981 Garden City. When the flood came at that time I should say there was a breast of water two or three feet high, and it ran down in a few days. After it ran down it reached about its normal condition, and that was very low water. The river was wide down there. It would be pretty hard for me to say how wide. I didn't cross it at this point. I would have to judge it by looking at it. There might be places there a foot and a half deep in the channel, but most of the stream, maybe, wouldn't be but a few inches, where the bars were.

In 1882 was the next time I was down in that country. I went as far as Garden City, I think, and was there about a week. I was down at the river bank there at one time on that visit. I
2982 think that was in the month of August. I didn't see any flowing water in the river at that point. There were some pools in deep places in the sand bars but I didn't see any water flowing, and I think I was in position to have seen it if there was any. I was right on the north bank of the river, looking across the river.
2983 I made no particular examination of the ditches there at that time, but just saw them, and there was no water in them. Usually in the spring we had some difficulty in getting water to irrigate our land. We would have to build a wing dam of some kind to catch a sufficient flow to fill the ditch. I am speaking of the ditch which we built to irrigate my own land. The dam was usually built in March and April and up to May, and this
2984 has been the case for a number of years back—for twenty years at least. The low stage of the water in the Arkansas river is usually in the spring and fall. That is the lowest season. Sometimes it occurs in the spring. I don't notice much difference in the amount of water at this period of the year between early times and later. If anything, there seems to be a little more at the present time than there used to be.

Cross-examination.

By Mr. ASHBAUGH:

2985 The high water in 1879 that I spoke of was at Fort Lyon in Colorado. I don't know whether it created a flood through the State of Kansas or not. In floods there was enough water passed down the river at Fort Lyon to make high water on down the river. The melting of snows does not have much to do with the rise of water in the river these late years. It melts in the mountains about as fast as it falls. There is nothing to hold it there. When 2986 the snow melts in the mountains I suppose it finds its way into the river. It does not come down at regular periods as it used to. It comes down more evenly than it used to. When I was in Garden City in 1862 I saw one or two old ditches around in the bottoms. They were ditches that had been dug and the 2987 grass growed over them, and they looked as though they had not been used much for a year or two. I mean by an old ditch a ditch that is abandoned and not used. What I mean by it is that it is a ditch in another State. When I was down on 2988 the bank of the river in Garden City I didn't see any lake on the north bank of the river. If there was a lake there near that street and within forty rods west of it I think I would have seen it, and I didn't see it. I don't think there is very much difference in the normal flow of the river through the State of Colorado now from what there was during the earliest years after I knew it. I don't know whether the river would be called unusually high this year or not. This year has been a very wet year all through this valley. This year has been a year, from my observation of the river, that the floods have not been as great, although the regular flow might have been more regular; but there have been no heavy rains to make these excessive floods that I have seen—none that came like what we call a cloud-burst.

2990 JOHN J. THOMAS, Pueblo, Colorado.

Direct examination.

By Mr. GREGG:

I will be sixty-eight years of age next February, and live right near Pueblo. I have been running green houses and market gardens for the last ten years, and the river runs across one corner of my land. I have lived in Pueblo about forty years. I belonged to the Colorado cavalry from 1861 to 1865. I was a member of the legislature in 1879, was county treasurer in 1867 or 1868 and 2991 was register of the United States land office at Gunnison, Colorado, from 1883 to 1887.

I was upon the Arkansas river in Kansas in 1864. We left Camp Fillmore, thirty miles below Pueblo, in June, 1864, and travelled

from there down to Fort Larned. I was a private in Company L, First Colorado cavalry, and we were ordered down there by the governor in the month of June. We stopped at Fort Lyon
2992 four or five days and the river at that time was bank full at that point. There had been rains previous to that. The amount of water in the river kept decreasing all the time. We went to Fort Aubrey or Aubrey crossing and camped there about a week. I presume that was about the 20th of June. At Fort Aubrey we could cross the river very easily. It was probably a couple or three feet deep. We didn't cross the river again the next point where we stopped, any more than one night was at the Cimarron crossing. The river there was very low. There was hardly any depth to it. Perhaps six inches running in two or three little channels across between the sand bars. We arrived at Fort Larned early in July and stayed there until the 10th of December, perhaps, and we crossed the river frequently—perhaps twenty or thirty times during that summer. That is near the mouth of Pawnee creek. There were places there where water was running a little, three or four or five inches deep, and at other places it was dry. It would run for a little piece and then would sink and there would be a dry sand bar. It wouldn't be dry, but there was no water in sight. There were places where no water was running on the surface of the sand
2994 at all. I made a trip up to the Cimarron crossing during the summer time. I was appointed wagon master and took a company up there to Company A that was camped there. That trip extended up to Fort Larned, up this way to Cimarron crossing. There were places where Company A was camped, about three miles below Cimarron crossing,—there were places there where the river was dry and no water in sight. At other places the river was running. I was up the river again in December, all the way up to Denver. The condition of the river at that time was about the same as it was when I was up the time before. There was some running water, and in some places it was dry. I never saw it dry above Cimarron crossing. Wherever we struck it above there
2995 there was some water. I went down near Sargent on the Santa Fe railroad, the year the road came in. That was in the spring of 1873. It must have been in the spring, because the road was lined on each side with buffalo carcasses that had been killed and skinned during the winter. The water near that point was running a small quantity. I presume it was a foot deep then. I should judge it was one hundred and fifty or two hundred feet wide, but the water didn't run all the way across. There was a sand bar and channel. The channel might be fifteen or twenty
2996 feet wide. I don't think it was over twenty feet wide.

I have lived on my land near the west limits of Pueblo for the last ten years, and right along side of it about thirty or thirty-five years, and I have had occasion to observe the flow of the Arkansas river particularly every year. The regular summer flood or flow commences from the 20th of May to the first of June and lasts

about thirty days. Sometimes it will run up to about the tenth of July, but more frequently by the first of July it is down about to its original flow. It is low in the late summer and fall, and from that on it is pretty low. The amount of water running there in the early years, compared with later years, I think, taking just the ordinary flow the way it is now,—that there is considerably more water
2997 now than there was in the early days. My land is on the north side of the river and adjoins the town on the west and is surrounded by it, so that the flow is about the same right through town here near the Federal court building as it is there, that being only seven blocks west. I know of some arroyos around or near the town of Pueblo which were formerly dry and in which there is now water running. (Objection.) I don't know that I can call them by name. An arroyo that comes down into the south side of the water works carries a large amount of water. Then there is a ditch alongside of it to keep the water out of the road. Then the next
2998 arroyo above it has no name. There was no water flowing in the arroyo of which I have just spoken before the Bessemer ditch was built, but it has been flowing since that time. Probably to the extent of one-fourth of an irrigating head, such
2999 as we use ordinarily to irrigate with. I would think there would be two or three—three anyway—cubic inches running down that place. That is to say, one-quarter of a cubic foot of water. I account for the water running in there now on the ground of the seepage from the Bessemer ditch. There are one or two more arroyos above that little draw that run down a small stream of water now which did not formerly; and then you come to one that Mr. Ault is using the flow of for running a wheel to grind kraut with. He runs a kraut cutter with a wheel; and that flow is continuous where it was formerly a dry arroyo. And I account for this by seepage from the Bessemer ditch and from the lakes and reservoirs. I should say there is very nearly one-half of a cubic foot—one-third of a cubic foot—of water running there now. There is another draw above that one,
3000 that has no name, that runs more water than it does; and I account for this by seepage from the Bessemer ditch, as it was dry before the Bessemer ditch was put in. It has a continuous flow. On the road down to the River View cemetery there are three or four more draws that run water that were dry before the Bessemer ditch was put in there, except in times of cloud-burst. And Salt creek, I should think, runs four feet of water now. It runs constantly, and I think it comes from the seepage from the Bessemer ditch and the reservoirs of the Colorado Fuel & Iron Com-
3001 pany; that is, there isn't any other way to account for the flow. The last one I spoke of is Salt creek, and that is a mile and a half from here, down the river. All of these arroyos take the water back into the Arkansas river again. (Objection.) The Bessemer ditch gets its water from the Arkansas river. It runs over the country south of Pueblo, coming out of the river about

twelve miles above Pueblo, maybe a little more than that, and runs over the table-lands south of the river and runs to the Huer-
3002 fano river. I should say it is thirty miles in length and about a mile back from the river here at Pueblo, and the farther down it goes the farther back from the river it goes all the time, and at the farthest point, where it crosses the Huerfano, I guess it is six or seven miles back from the river. The drainage from that land covered by the Bessemer ditch reaches back to the Arkansas river. I have known Fountain creek for years in the early days to be dry for several months in the summer time, unless there would be a flood, cloud-burst or something there wouldn't be a drop of
3003 water in it. That was going over a period of ten, fifteen, twenty and thirty years ago. I know the last two years I have had occasion to cross it a good many times and to be along it and it has had a current of water in it the year round. I should judge that it was six or eight inches deep and twenty or thirty feet wide, and it flows now all the year round during the dry season also. I account for the difference in the flow of Fountain creek by the seepage from the ditches and in no other way. By that I mean that the water soaks into the ground from the ditches and reservoirs and strikes bed rock and then flows into the river. The waters from the irrigated lands return to the Fountain creek. They are obliged to, from the lay of the country. (Objection.)

Cross-examination.

By Mr. ASHBAUGH:

3004 The town of Sargent I spoke of was a mile east of the State line, in Kansas. When we were down there in 1864 and went from Fort Fillmore to Larned the river was bank full, and when we left Camp Fillmore it was pretty near to the top of the doors of our cabin where we wintered. We had to move up onto a high point and had to carry our things out. The river was running bank full when we got to Fort Lyon, perhaps fifteen days after that. I think the river was running down some before
3005 we left Fort Lyon, and when we got down to Fort Aubrey the river was pretty well down to its natural stage. Its natural stage down there was running about a couple of feet of water, perhaps. All we could tell of its natural stage would be from the looks of the banks. There was no overflow or anything. There were places in Kansas it was dry and other places it would run some water. I saw it almost every day that summer. I don't know what the river had been in prior years. If it had flowed more water in the earlier years it would certainly have showed it. The bank
3006 is not over a foot or two high. It didn't show any signs of being out there. There was no drift-wood or anything of that kind. I don't know whether the river had been out of its banks or not, but if it had it certainly would have left some signs or showed some drift-wood or something, but I can't tell anything

about what the natural stage was prior to that time. The June flood I spoke of I saw for more than thirty years. It sometimes lasts thirty days and sometimes a little longer, but very seldom. As to where it comes from, I am speaking of the melting snows and the rains that come in the spring, not from the floods. Sometimes there are rains that come with that that make very high water. As to a general and uniform rise every year, that comes from snow and rains in the mountains. The rain comes and takes
3007 the snow off.

Some of these arroyos I spoke of do not reach up but a few hundred feet from the river, and I think the water that gets back from the Bessemer ditch helps to increase the average flow of the river for the year. I don't know how much gets back from the Bessemer ditch, but I know of ten feet of water that gets back
3008 from it. That would be my judgment. But not from that alone, but from all the other ditches. I don't know how many ditches there are, but I know of some up in Chaffee county. They are right on the Arkansas, about a hundred miles up the stream, and the seepage gets back into the river long before it gets down here. I don't know what the amount of water that generally flows through the Bessemer ditch is. I have no idea as to what proportion of the water that is used in irrigation becomes seepage water and gets back into the river. It couldn't go anywhere else. It has to follow the slope of the bed-rock into the river. I know the seepage water goes back into the river because I see it every day.

3009 OLIVER H. P. BAXTER, Pueblo, Colorado.

Direct examination.

By Mr. GREGG:

I am sixty-nine years of age; am in the real estate business now; and have been here since October, 1858. I was the first commissioner of Pueblo county under Gilpin—one of the first—and organized the county. I was in the legislature for two terms, and have been county commissioner for eight or ten or twelve years, all told. I have been in the city council, etc. I was in the army in 1864, captain of Company G of the Colorado Third, and was down the Arkansas river in Kansas. We were after the Indians there
3010 in 1864. It was in the latter part of November or the first day of December of that year. We were some sixty or seventy miles down beyond the Kansas line. We struck the river there. We only stayed on the river, I guess about six or eight miles. We left it then. That was this side of Dodge some distance. When we struck the river and all the time we were on it there was no flow of water at all. The reason this is impressed upon my mind is that when we went into camp we had to dig in the bed of the river to get water in the sand. There was no running water at all. Dodge
3011 City was Fort Dodge at that time, really. There was no running water in the channel when we dug in the bed of the

river. I have not been on the river in Kansas since that. I came up the Platte river in Colorado in 1858 and stopped at Denver or where Denver is now. I located land near the Arkansas river in Colorado about six miles below Pueblo. The river ran through my land and took a good deal of it away. I built an irrigating
3012 ditch; I think it was four feet at the bottom, six feet at the top and two feet deep. I figure it would carry about eight or ten cubic feet of water. We started it in 1861 and finished it in 1862. I think we irrigated something between twelve hundred and fifteen hundred acres.

There was a great drouth in the States of Colorado and Kansas in 1863, and there was one year, I couldn't fix the date exactly, but I think some time in the '80's, when it was almost as dry, and of recent years it has not been so dry as at those particular times. I think 1902 was about an average year, but I don't remember distinctly.

3013 I have noticed some arroyos around and near Pueblo which were formerly dry in the early years, and in recent years, particularly on the other side over here, since the Bessemer ditch was built, there is any amount of water coming down a great many of those arroyos continuously. (Objection.) I account for this water as coming from the seepage from the Bessemer ditch, which it undoubtedly does, as I can account for it in no other way. The Bessemer ditch irrigates the high lands south of the town all the way down to the Huerfano.

Cross-examination.

By Mr. ASHBAUGH:

When we started at soldiering here in October, 1864, it was
3014 very muddy and wet. We had a terrible winter in 1864-5. That was the worst winter we ever had in Colorado, and we had a good deal of water. There was no water in the river down in Kansas when we struck it. The water that we found flowing in the river in Colorado when there was none below in Kansas went, where it always goes, into that sand down there on the plains. We had no trouble about finding water by digging in the river bed, and that is one evidence that the water sinks into the sand. As the water came to different formations it would go into the sand. The sand gets more and more as you go down the Arkansas river. This exists both as to width and depth in the river.

3015 The ditch that I spoke of I think was commenced in October, 1861, and started about six miles below Pueblo and was known as the Baxter & Warren ditch. I think it had a decreed appropriation of eight or nine second-feet. The Bessemer ditch does not cross every one of these arroyos, and where it does not cross them the water gets down into that gravel and sand and
3016 works its way down and forms an underflow. There is bed rock here and in some places there is four or five feet of coarse

gravel. I couldn't answer the question as to what proportion of the water is used in irrigation becomes seepage and finds its way back into the river, but from Cañon City all the way down there is a great amount of water that comes back from those sources into the river. There is quite a good proportion of the water gets back, but how much I couldn't say.

By a "highline" ditch I mean one like this Bessemer ditch that goes back onto what we call the mesa lands. Our ditch followed the bottom lands, while the Bessemer ditch follows the high ground.

Redirect examination.

By Mr. GREGG:

3017 The seepage water from the Bessemer ditch would seek the Arkansas river and the seepage from the lands irrigated by the ditch we built would also seek the Arkansas river as it followed the bottom very closely down, the whole bottom which they farmed in the early years.

3019 LEWIS CONLEY, Pueblo, Colorado.

Direct examination.

By Mr. HAYT:

I have resided in Pueblo, Colorado, nearly forty years, since and including 1867, and I am nearly eighty-one years of age. I have been a contractor and builder most of my life and have been for a while in Colorado a farmer. I farmed between here and Cañon City on Beaver creek. That is a tributary of the Arkansas river. And on the Chico, about fifteen miles below Pueblo, under the Excelsior ditch. I was born in New York and came to Leavenworth in 1858 and to the Rocky mountains in the spring of 1860. It
3020 was not Colorado then. I saw the Arkansas river first in 1860 at, I think, Great Bend, and about sometime in May. I was travelling at that time with a company from Leavenworth to Pike's peak in company with another family. There were only two families of us. We were in company with others off and on.

I recall very distinctly the first time I saw the Arkansas river and the impression it created on my mind. I was surprised to only find a great, sandy channel or bed and to hear it called a river, with no water in it. It rather struck me as though we hadn't struck the Arkansas river yet, but still we were told that was the Arkansas, and it was. We followed the course of the river from there clear up to Cañon City. The river was perfectly dry at the point where we first struck it, and I think the first place we struck run-
3021 ning water was about where Fort Lyon, Colorado, is now. The water was simply running at that point in a small stream. I am not sure that we struck much water, though, until

we got above Fort Lyon. I think we struck a channel of water there and it sank into the sand. I recollect of noticing it quite particularly, as we thought we had struck a flow of water that would keep on, that perhaps there had been higher water somewhere up in this country above us, and my idea was that it was coming, but still it didn't gain any. It kept sinking and sinking. It didn't seem to gain any headway from where I first saw it at Rocky Ford. It sank in the sand. We averaged from twenty to twenty-five miles a day, having ox teams. We reached Fort Lyon somewhere in the latter part of May. The water increased from Fort Lyon
3022 every day a little as we came up, and the old-timers along, the old travellers who knew something about the country and had been here before, told us we were getting the melted snows that were coming down, and we were getting a little more and a little more water every day as we came up the river. The channel got a little larger and larger. There was no settlement here at Pueblo at all. The only settlement was a little Mexican one at what we called Fountain City, across on the other side of the Fountain. There were a couple of mines below there, and we passed right on up the river to Cañon City. There was no settlement between Pueblo and Cañon City at that time, and nothing at Cañon City except two or three—a blacksmith and a wagon repairer and two or three pioneers. We found no irrigation ditches on this trip at all. I have seen the Arkansas river from that time up in this country until now. I saw the
3023 river in 1861 from Cañon City to Fort Lyon. There was plenty of water in it then. 1861 was not a wet season nor an extremely dry one. The river was in a moderate stage. We made two or three trips from Cañon City to Fort Lyon, one about June, and then about September, and I think one between, and the water was at a good, fair stage, all the way, pretty nearly alike, to Fort Lyon. I think the stage of the water generally was a little less from Fort Lyon—between Rocky Ford and Fort Lyon—than it was above. It seemed to be a little smaller river below Rocky Ford than it was from Rocky Ford to Cañon City. I noticed that it was growing less as you went down. I didn't take any particular notice of the amount of water in the river at Fort Lyon, any more than I
3024 thought there was less water than there was up in about Rocky Ford. It had a little less and less, but not very much difference. It seemed there was considerable seepage. I crossed the river in the vicinity of Fort Lyon. It was a ride or drive across with a team. I should judge that where we crossed at the ford the water would come up to about the hubs of the wagon in the deepest point of the ford. I don't know exactly how wide the channel was, but not very wide. Possibly it might have spread out where the ford was to a couple of hundred feet, maybe, but not all the way that deep. That was the deepest place. And at the shallowest place it ran up to a foot—out to nothing.

I saw the river again in 1862. At that time Fort Lyon had started up and there were soldiers and a post there, and by this time

we had gotten to farming some up here, trading our produce
3025 with the commissary sergeant there for sugar, flour and rice and anything they had to trade for vegetables and what we had. We made two or three trips down to Fort Lyon in that year, as I said, in the late spring and up to the fall. In 1862 there was a little more water in the river than in 1861. 1862 was what we called a wet year. Not extremely wet, but a little wet, and the Arkansas river was a little higher, but it was more noticeable up here than at Fort Lyon. You couldn't see much difference there, but there was a difference. It was a little higher. There was a little more water at Rocky Ford in 1862, enough to perceive it was a little higher. In 1863 I don't recollect whether I was at Fort Lyon more than once, but that was a very dry season and the water was extremely
3026 low. The river was dry in places between Pueblo and Fort Lyon, where there were only little bits of channels running, and in places it was standing in holes. As you got nearer Fort Lyon there were dry places—places where there was no continuous channel at all.

I think it was in 1867 I made the plans for the bridge at West Las Animas across the Arkansas river and superintended the building of it. I think West Las Animas is the same as the present town. I was only down there a few trips at that time, just to superintend the bridge. I didn't attend to the whole building of it. Another man had the contract for building the bridge, but it was under my supervision and plan. It was built by the Las Animas Company. I don't recollect now who was in it with the exception of Captain Craig.

I am not certain of the months in which I was there in 1867, but it was along through the middle of the summer and tolerably late in the fall, perhaps as late as October and maybe as late
3027 as November. That season the river was in a pretty fair stage, perhaps a little above the average, and when we were building the bridge, the water, I suppose—it was in a place of slack water that was backed up, and I suppose where the bridge was built the water would average nearly three feet deep, nearly across the river, or perhaps half way across, and then sloped up gradually to nothing. For driving the piles we used a flat-boat, because it was more convenient. It was the most convenient for staging—for driving the piles. A little ways below where the bridge was there was something like a ledge in the river that held the water back
3028 and made the channel smaller where it passed over that ledge. I think that ledge ran only a part of the way across the river On one side of the river it was limestone formation and on the other side there was no rock formation at all, just dirt. That was on the deepest side of the river. The water in the river ran over this ledge. I should judge it was a foot deep when it passed over it, and the channel was perhaps forty or fifty feet wide. There was practically no fall at all in the river, just simply a little river, you might say. I didn't go below there that year, that is, in that vicinity, only down

about the mouth of the Purgatoire, which was, I think, four or five miles below there. I didn't go with a view of examining the river; I simply had some acquaintances living there.

I have had one year's experience in rafting ties down the
3029 river. That was in 1875. We started up in the mountains somewhere about what we called California gulch and the South Arkansas sometime in May. California gulch is where Leadville is now. We aimed to take advantage of the high waters on account of the melting snow. The ties were cut through the previous winter, and those that came out of the side streams, for instance, what we called the Cottonwood mountains—the Cottonwood range—there were two streams called the Cottonwoods came out and they joined a mile or two or three miles before they came to the Arkansas. Up those steams in the mountains were some lakes, and we fixed those lakes—we dammed them up and could raise the water, especially in one of the lakes, about three feet, and in the other about twenty inches, I guess. We would let that accumulate over night and have a man stay there over night, hoist the gates
3030 and let the water down about two or three o'clock in the morning so that it would get down for us where we had the ties and it would help us give the ties a boost to get them toward the Arkansas. In that way, after working a week or ten days, I think, we got one hundred and sixty thousand ties that we had in the Cottonwood mountains down to the Arkansas. We boosted them along while that flood lasted for a mile or two or three miles, whatever we could, and then we would have to wait until the next day. Finally we got into the Arkansas river, when of course we had the benefit of that water out of the Cottonwood and the Arkansas together, together with a stream that comes out of California gulch, to help us along, and then we had men to help us punch those ties along separately and keep them going. We still relied upon the water from this lake in the Cottonwoods to help us along. It was pretty hard work and we were anxious to get down below the South Arkansas in order to have the help of that stream and had a good deal of work before we got them there. The South Arkansas empties into the Arkansas below Salida at a place
3031 called Cleora. Finally we got the ties down to Cañon City. When we got a little below Salida—I forget what you call the place, but there was a stage station there in those days. It was a little below the mouth of the South Arkansas—we got some rains. We got an elegant rain there that gave us a nice boost and helped us clear down the Grand Cañon. We had some trouble in the latter place. We had some gorges there and had to punch them up and punch them through the gorge and finally we got to Cañon City, and there we had a little rain that helped us a little and raised the river a little and we got them down to Pueblo very well, and right through the town of Pueblo we had a good little rain. We got them down about ten miles below here to the Chaffee ranch and there we had a good rain in some

branches above that came down and gave us a pretty good boost pretty well down to Rocky Ford. As we went down about to the Chilcott ranch we had this little flood on, helping us along down to about Rocky Ford, and we had considerable punching and running in getting them down until we got to about the Apishipa. No, we hadn't yet got to Rocky Ford. We were having some trouble
3032 in getting them along, and when we got down near the Apishipa we had a good flow in that river and it helped us wonderfully. We were down pretty nearly opposite there, ready to get the benefit of the flood, and the flood in the Apishipa took the ties all out of the river and took them out for two or three miles across the country. I don't know how big the bottom is there. The trouble we had before reaching there was on account of the want of water. You see the water was so limited, the channel was so small, that the amount of ties we had, if they accumulated, they gorged and stopped. It took about a foot of water to float them. There were some places in the channel where it was more than thirty or forty feet wide that was deep enough to run a tie. Perhaps it was from eighteen down to ten inches deep. These ties, running, accumulated and held up some water behind them, and that helped to push them through. Even the running—floating—ties acted as a dam, and helped to keep the water up behind them, and that was a benefit to us in running through these narrow and difficult places.
Below the Apishipa this flood came down and got our ties and
3033 and carried them out of the river entirely and across the bottom and over the country, and over next to the bluff it was lower than it was between, you see. I mean the north bluffs. It seemed there might have been a sort of channel there some day. It was not an old channel, but it looked as though it might have been at some time in high water that water might have run there. After the ties were carried over by the floods we kept punching them in and carried them on around and brought them back into the river again below. It must have been six or eight or ten miles around this circle. The water in the river opposite these bluffs before the flood was so shallow as to cause difficulty in running the ties, and at the
3034 time of the flood there was water in the channel but our ties hadn't got below the force of this water coming from the Apishipa, so that this flood caught the ties as they came along and carried them around and brought them into the river below, but still it left some scattered between, nearly twenty thousand. We had a hundred men helping us back in the mountains getting these ties. This flood kept up in the river long enough until we got down to the Timpas. By the time we got there there was a flood in the Timpas again that helped us on with the ties until we got down to Las Animas. We didn't ever expect to succeed in reaching the place. The railroad company was not expecting to get the ties that year at all until they saw that these floods helped us through with them.
3035 I don't think we could have gotten these ties down if it had not been for the assistance of the flood. When we got to Las

Animas the floods went down and the water was pretty low. At the time of the floods the water was high enough to dam up the ties against this bridge I was telling you I built, and it carried the ties over the floor of the bridge to the railing of the bridge below. But these were not our ties, they were some run down by Bush the year before. There was very little water below the bridge except in this flood. I couldn't tell how much, but not enough to call it much of a river. Quite a small stream. Not enough to carry the ties farther.

Cross-examination.

By Mr. ASHBAUGH:

3036 In the spring of 1860 when I struck the river at Great Bend we had rain below Great Bend, but I think no rain between Great Bend and Cañon City. I think there was no drouth over this country in the fall of 1859 and during the whole of the year 1860. No, that is not true. The great drouth was not until 1863. There was an abundance of rain west of Great Bend in 1860. After I reached this country there wasn't a drouth. There was rain through western Kansas in 1860, in the fore part of the month of May. We crossed the Kaw river some place where I don't remember the name, and for two or three weeks had several very
3037 heavy rains. This was on the Santa Fe trail south of the Kaw river and north of the Arkansas. The rain I speak of was in the Arkansas valley.

When I came up the river in 1860 there were no signs of any such thing as an irrigating ditch. There was a great drouth through the Arkansas valley in 1863.

I was not the first one who rafted ties down the Arkansas
3038 river. I think Mr. Bush rafted some down the year before, which was, I think, 1873, and other parties had rafted ties before that time, but not, I think, in more than one year, though I am not sure. I think these parties rafted ties down in two different years before ours. We got our ties down to Las Animas and turned them over to the Santa Fe Railroad Company. The Santa Fe
3039 railroad was built up the valley that year. That is the way the Santa Fe Railroad Company got its ties then. They took some of the ties below Las Animas, and perhaps as far as the State line, hauling them by team. The ties that were rafted down the year before ours were used for the Kansas Pacific. Some of those ties were taken out at Cañon City and at other points along down. Some of them were lodged on the bank for want of water to run them and were taken up. I don't think anybody rafted ties down the river after 1875 when the railroad was built. Taking the bed of the river through the city of Pueblo in those years as compared with what it is now, I don't think there is a great deal of dif-
3040 ference. The channel is, however, altogether different. It has been straightened a good deal. It has been straight-

ened in places. In high water the river spread all over the country here and in low water it was a little stream that you could pretty nearly step across, at any rate I have waded it hundreds of times.

I have heard of boats built here at Pueblo that went down the river. I have known of one or two that were built and started here, but I never knew any to get any great distance. The first
3041 one was built, I think, in 1864. It was something like what we call a scow—a sort of flat-boat. The man who built the boat got onto it somewhere here below Pueblo and went down a few miles and ran into a drift or snag pile and capsized and was drowned, and that was the end of his boat and the end of him. The boat drowned also. There were one or two cases of some fellows that wanted to go East and were "broke" and got a little boat of some kind and started down the river, but collapsed down here about Boone, as I heard. I don't know of any boats that were built here that got through. There was water enough in the river to drown a man in the year 1864. That was the reason of his building the boat—because there was an extraordinary run of water here and he thought there would be water enough to take his boat down into Kansas, I suppose. There was no occasion for floating ties
3042 down the river after 1875, for the railroad had been built then. The railroad didn't reach Pueblo until 1876. I think we had 268,000 ties that were floated down the river.

Redirect examination.

By Mr. HAYT:

I mean by "rafting" ties that they were simply floated. They were punched. Punching ties, we called it. Rafting was an impossibility. Each tie was separate. There were places, you know, where there was slack water for some miles where ties could be floated along easily by men going along on each side of the river and keeping them together. I don't know that anyone ever attempted to float ties after 1875. I think not.

3044 P. F. LULL, Pueblo, Colorado.

Direct examination.

By Mr. DAWSON:

I reside in Pueblo and have been in this country about twenty-five years. I saw the Arkansas river in Kansas in 1872, from Fort Zarah clear up to Fort Dodge. Fort Zarah was near the present town of Ellinwood. We came by wagon and followed the course of the river. The water stood in pools in the river. There was no running water. I don't recall striking any running water,
3045 except there was a little when we got up to Fort Dodge. We got water for our stock in some places by shovelling up the quick-sand and keeping it moving so as to let the stock

drink, and did that often to get water to cook with. We did this in the bed of the stream. We went over there in June. I was leaving Salina, Kansas, and went over in May. We reached Fort Dodge in June, and I was there all summer, and I have had no opportunity since then to observe the river in Kansas. When I first came out here I was in the employ of the Rio Grande Extension Company when they built the railroad. At the present time I am bailiff in the district court of this county.

Cross-examination.

By Mr. ASHBAUGH:

3046 There was not any high water in the river to amount to anything in the year 1872 down in Kansas. I was on the river from May, all summer. I went over and helped survey Ellinwood. There was a little more water in the river up at Fort Dodge than away down by Ellinwood. There wasn't much flowing water in the river at Ellinwood, and no flowing water at Larned at all. Up at Dodge along in the fall the water came up and flowed some, because
3047 I crossed the river at Dodge with some teams, hauling buffalo hides. I don't know how it was up the river, as I didn't come west of Dodge at all. We could always get water in the pools in some places. We would have to dig up the sand. But there was no water running from one pool to the other. There was water above all the time in the winter, but it sank into the sand.

3048 GRANVILLE G. WITHERS, Pueblo, Colorado.

Direct examination.

By Mr. DAWSON:

I reside in Pueblo, and at present am superintendent of the north side water works; that is, the water works that furnish the city with water north of the Arkansas river in Pueblo. The main plant is situated on the north side. I have lived in this locality for thirty-four years, and I will be fifty years of age on the 30th day of January. I first crossed the plains in the spring of 1862. I was a boy
3049 at that time in the neighborhood of eight years of age. I came in the old Southern Mail & Express Company's stage. We took it at Westport, Missouri. We travelled along the Arkansas river. I don't positively remember just where we struck it, but somewhere in the neighborhood of Dodge or Larned. Along in that part of the country somewhere. The stage stopped along the river, and we were out every minute we could get out and get away from the people who were trying to hold onto us, as children. My brother was with me, and a boy named Johnnie Adams, about my own age. The old stage road followed right along the river for quite a distance, right along the the bottom, in fact I should judge

it was a couple of hundred miles or more that it followed right along the river. I don't remember positively the month, but it must have been sometime in the latter part of April or first of May. It
3050 was comparatively warm, although it was cool in the mornings and evenings. At different places where we stopped and travelled along there were great stretches of sand in the river probably a quarter of a mile wide where there didn't seem to be any water at all, and where we stopped close to the river us "kids" would get out and chase down onto that sand and my mother would chase after us thinking we were going to get into some kind of mischief and trouble, and we would get out and dig holes in the sand. There was no water on top. The men would did holes, bigger holes, in the sand—and that showed us how to dig—in order to get water for their stock. There were various places along the river, stretches that we saw, which were dry so far as any running water on the surface of the river bed was concerned.

Cross-examination.

By Mr. ASHBAUGH:

3051 I don't know that my mother was afraid we would get drowned, but she was afraid we would get away and the Indians would catch us and she was watching us pretty closely. I don't remember whether there were any water holes or not; I don't remember seeing any along in that part of the country. A boy's recollection is all I pretend to have; but it is very distinct, that part of it. I don't pretend to say where we struck the river, nor where we left it, although I do remember we left the river at Fort Lyon, and there was plenty of water there. I don't know how long we were on the river, but it was several days. We must have been two weeks in making the trip from Westport to Iron Springs, thirty-five miles from Fort Lyon. The water that we found plentiful at Fort Lyon must have sunk into the sands as it went down the river. I should think the river, as I recollect it, was in the neighborhood of three hundred feet wide, but of course you understand that is a very indistinct recollection because I haven't been there for years since and I haven't been down the river so as to refresh or correct my recollections at all.

3053 C. B. SCHMIDT, Pueblo, Colorado.

Direct examination.

By Mr. HAYT:

I am sixty-one years of age, and reside at Pueblo at present. I am manager of the Suburban Land & Investment Company, which controls land along the Bessemer irrigating ditch. It gets its water for the irrigation of its land from the Bessemer ditch. I am also an officer of the Bessemer ditch. I came to Missouri in 1864 and to

Kansas in 1868. In Missouri I was following the mercantile business, at that time, and I was induced to come to Kansas in 1868, as it was the opening up of the State, and it was the supposed chances for business that tempted me to come there. And then I
3054 came to Lawrence in 1868 and followed the mercantile business, and in 1873 entered into an engagement with the Atchison, Topeka & Santa Fe Railroad Company to take charge of its immigration interests as commissioner of immigration. I held that position until July, 1885. The territory embraced within my jurisdiction as immigration agent was the extent of the land grant of the Santa Fe road. Those lands began on the Cottonwood river in the vicinity of Florence and Marion and extended to the west line of the State—a belt of forty miles in width along the line of the road from that point. I think approximately there were 3,200,000 acres to dispose of. My first work was to compile literature—advertising literature—in the German language, for use in Germany and among the Germans in this country, and later on as the work progressed the entire immigration colonization work was placed in my hands, and I travelled abroad. I travelled through
3055 the United States and travelled in Europe and induced people to come out, and when they did come out located them upon the land grant. I had an office with headquarters at Topeka, with the general offices of the Santa Fe Company. My first mission was to travel over the line and familiarize myself with the character of the country, and the company desired that I should select a large body of land somewhere where I thought it was most suitable for a distinctively German colony, where I was to center as large a body of German settlers as possible. That was the first thing I did, and I selected for that particular purpose ten townships of land in the Arkansas valley, the center of which is the present town of Ellinwood in Barton county. About half of the land was on the north side of the Arkansas river and the other half on the south side. At that time there was a fort there called Fort Zarah. It was somewhat nearer Great Bend than is Ellinwood. But that was at that time all abandoned and the settlers there hauled away the stones that comprised the buildings and used them for foundations for their houses. I began in January, 1873, in locating that land in Ellinwood, and
3056 the settlers began to come in during the latter part of that year, and in 1874 they came in very large numbers. In that particular vicinity I should say that I located five or six thousand settlers, and they are still remaining there and are very prosperous.

In regard to my familiarity with the Arkansas river, commencing with the year 1873, at first it looked very discouraging to me, and I found when I had people to show over the country that they always objected to that dry river, and they claimed that the general supposition that this was the American desert was shown by the condition of the river there. It was most always absolutely dry, and we had that to contend with always when we brought the

settlers out. The river, in fact, so far as my work was concerned, was a bugbear. I had to explain why that didn't make any difference to the settler, that they could get ample water for domestic use by driving wells upon their lands, and even ten miles away from the river they could strike water at from thirty to forty feet and close to the river at fifteen to twenty feet by simply driving a pipe down with a perforated point to that depth, and there would be an inexhaustable supply of water for their use.

3057 It was the policy of the company not to induce settlers to go beyond a certain point, which at that time was Larned. It was supposed that by advancing the settlements in closed ranks it would be much safer for the settlers than to isolate them too far out, on account of the dry condition of the country. But the time came, perhaps in the years 1876 and 1877, when the company was actually forced to open up the western part of its land grant as far as Dodge City and beyond it, because homesteaders who were taking up the Government land had scattered all abroad and they were anxious and the county officials were anxious that the railroad company should put its land in this county upon the market as well. The railroad company owned within the belt of its grant alternate sections, the alternate sections in each township being the odd

3058 numbered sections, and the Government retained the even numbers. I should think, so far as I can remember, that the company commenced extending the sale of its lands west of Dodge City in about the year 1880. I frequently had to travel along the river and cross it at many points, usually with intending settlers. I crossed the river at Wichita, I crossed it at Hutchinson, at Sterling, at Ellinwood, at Great Bend, at Larned and at Kinsley, and as a rule the river was then easily fordable. Most generally we crossed the river in wagons, before bridges were built at these several points, without any difficulty whatever, only occasionally we would have to cross a channel on either one or the other side of the river, but never with any difficulty. As a rule the river was dry and you could pass over it almost dry shod. In fact you could see the tracks of horses and wagons and men over the bed of sand from one bank to the other. I have seen the river absolutely dry for long distances at Hutchinson and at points west of there so far as I had

3059 business to go. The bed was almost always so. I remember very few instances where we had to postpone or give up the crossing of the river on account of high water in it. The river was a sandy run. In some places the sand was dry, where it was high. Where the sand had been piled up it was absolutely dry, and in some other spots it was moister. You would sink in perhaps a few inches into the moist sand, and then at some points there were water puddles collected, and then probably on one side or the other there was a narrow channel where the water would run, but frequently there were not even those to be seen.

After 1880 my visits along the Arkansas river were very infrequent, because my work was then abroad. I only went over the

road when I happened to come over to this country occasionally, and I didn't make any very close observations then. I generally ran along the railroad to some certain point in New Mexico
3060 or Colorado.

The tributaries of the Arkansas river west of Newton were frequently high and augmented the flow of water in the main river. There was especially the Little Arkansas, with its tributary, Turkey creek. They carried quite a large volume of water, and I think that tributary was chiefly responsible for the high water in the vicinity of Wichita occasionally. I remember a water mill at Halstead, which was on the main line right eight miles west of Newton. That was three times washed away, until it was finally replaced by a steam plant some distance back from the creek. I frequently in trying to cross the Arkansas river and Turkey creek had to make a detour to get across. There were no bridges there.

The next stream to the Walnut is the Pawnee, which empties into the Arkansas at Larned. Very frequently at Larned you would see the vicinity of the town under water from the overflow of the Pawnee, and the same condition existed along the Arkansas between Wichita and Newton. We had a large body of land there. It was rather level and low and flat. It was frequently under water.
3061 I don't know of any other stream that would affect the river very materially except those three—the Little Arkansas, the Walnut at Great Bend and the Pawnee at Larned—and these streams have their rise within a comparatively few miles of the Arkansas river, north, in the State of Kansas, and the high waters that I noticed usually came from the rainfall. I should judge I was directly official in settling about twenty-five thousand people in that vicinity, of whom fifteen thousand were Mennonites whom I brought from southern Russia and who are still there, largely increased.
3062 The Bessemer ditch has its headgate at a point about eleven miles west of Pueblo on the Arkansas river, and it runs from there in a meandering course for a distance of forty three miles eastward along the south side of the river. Its appropriation dates back to 1887. It crosses the south side of the city of Pueblo at a point, I should think, about a mile south of the Arkansas river, and crosses the steel works yards. The water is decreed for irrigating and domestic purposes only, and the land irrigated thereunder drains to the Arkansas. I have had occasion to notice the seepage or return waters. The main ditch at no point is farther than two miles from the river, and all the depressions or arroyos are now running seepage water back into the river. The discharge of this seepage
3063 water into the river has increased from year to year. When I first came here about ten years ago very little of that water could be seen in any of the arroyos, but now since nearly all of those lands are in cultivation the seepage has increased very largely. We took occasion some three years ago to ascertain what proportion or how many cubic feet per second of this water was turned back to the river in that way. Mr. J. S. Green, who is an engineer in this

city, and who has at one time been State engineer, undertook that work, and he makes his calculations and reports to us that about seventy cubic feet per second was turned back into the river of the water that was turned into the ditch. We did that for the purpose, if possible, of reclaiming that water for our headgate, although we have not made a very serious attempt to do that yet, because it seems to be very problematical as to whether we will succeed or not.

3064 There is a body of land along the bluffs just east of town here perhaps from two to five miles, which lands have been submerged to a great extent by the water, and the owners charge that it is in consequence of seepage water from the Bessemer ditch, or rather from the lands irrigated by the ditch. The ditch at that point is probably a mile and a quarter or a mile and a half distant from those lands, and it was finished in 1889 and operated in 1890, and it seems that the damage didn't attract attention until some four years ago—1899 or 1900—when these people commenced suit against the ditch company for damages to their land by seepage water. I came here in 1895, and it was then apparent. That was five years after the ditch had been put in operation.

Cross-examination.

By Mr. ASHBAUGH:

3065 I have been a director of the Bessemer Ditch Company for nine years now. I represent the eastern stockholders in it. The kind of literature that I prepared in describing the lands in Kansas is the kind of literature that is usually prepared for such purposes. We didn't dwell particularly upon any description of the Arkansas river as a dry river with no water in it. We didn't do that because it was a matter that would have to be ascertained. At that period when I commenced my work I didn't know the character of the river thoroughly. I began to write my literature as soon as I came

3066 there on the basis of the literature that I found there. I went to London in 1879 and continued my work with the Germans, as I speak their language. As to whether I told them that the Arkansas river is a dry river, I will say it is very difficult to remember just what I did say about the river. And as to it being a dry river—well, I of course had to dispose of the lands of the Santa Fe company. No sir, I don't know that I did emphatically tell my friends in Europe that the Arkansas river was a dry river, unless I was asked. We had a map showing it to be a river, and we called it a river, and most of the time it was dry and a bed of sand.

As to the way I induced those people to settle at Ellinwood whom we called Mennonites—well, most of the Mennonites didn't settle along the Arkansas; they settled in Marion and McPherson

3067 and Harvey counties. A good deal of Harvey county is in the valley of the Arkansas river, and also McPherson county. As to whether I told those people honestly and fairly that that was a dry river—well, the people, before they came to that country, re-

ferring particularly to the Mennonites, they had a delegation of seven of their most trusted clergymen come over here to explore that country before they came over to settle. They knew, and as to the condition of the river being a dry stream, they would ask the question in their letters. Other intending immigrants would ask what the water supply was, and I would tell them that anywhere through the Arkansas valley the people could obtain their domestic water by simply driving iron pipes to a depth of fifteen to
3068 twenty feet. The water level where they found the water in these wells would be below the water level in the river, naturally. It is more than I can tell where the water comes from that we found in those wells. It was supposed to come from the underflow of the Arkansas river, the bottom being sandy. (Objection.) In fact we told in our literature—we spoke of that fact, that for many miles on either side of the bank of the river the soil was permeated with water, and it was naturally supposed at that time that there was an underflow from the Arkansas river. No one disputed that within my knowledge. If there was any underflow there I should think they would get it from the Arkansas river. My observation didn't reach beyond Dodge City in respect to getting water in the valley, and I know that was a fact this side of Dodge City at Offerle and Kinsley. The water that came into the wells in the Arkansas valley at Kinsley, Offerle and Dodge City must have come from the underflow of the Arkansas river.
3070 There is no tributary of the Arkansas river in the State of Kansas that had anything like a perennial flow, west of Larned. In the best of faith and on the best information we could get I told those people that they could always find a supply of water from the underflow of the Arkansas river, and I presume others did the same thing. The lands of the Santa Fe Railroad Company were largely built up because of the fact that there was at some times water in the Arkansas river, and when it was low there was always water in the underflow; but most of our settlers kept away from the immediate vicinity of the Arkansas river. They preferred to go upon the upland where they could produce the largest crops of wheat, that being better for wheat than the river valley. I have not been down there for some years.

3071 The original grant to the Santa Fe Railroad Company was ten miles on either side of the track, and they received an indemnity grant of an additional ten miles on each side to a point as far as Dodge City. This grant was originally from the Government to the State of Kansas, and then by the State of Kansas to the Santa Fe Railroad Company.

As to the condition of the river, I have seen flowing water in the river during the summer time, perhaps in June. I have occasionally seen water in the river as late as September. Of course the people there spoke of these rises in the river as the "spring rise." No other term was used. A June rise would be about the same

period, and that was what the people settling there meant by
3072 that term. This June rise would probably last for eight or ten weeks. I don't suppose that it was sufficient to saturate the valley each year back to the foot-hills. There was water permeated. There was always water coming down through the tributaries of the river, and from the river direct, and I presume it kept the sand saturated more or less the year round. I never have remembered that the people at that time failed to secure water at any time of the year when they drove down a pipe to get it. I never noticed in that connection that at some times of the year they would have to drive further than at other times of the year. I have noticed, though, that the farther back from the river they would go
3073 the deeper they would have to go for water.

I was at Kinsley once in the month of March, in 1898, and I noticed a small tract of land of about eight acres of ground belonging to Jacob Smith where he had shade trees, fruit trees, grape vines, berries of all kinds, and vegetables, and he obtained the water for that with a wind pump, and at that time the water
3074 was running constantly out of that well, the pipe reaching down nineteen feet.

In our literature, as to there always being high water in the spring or at some time during the year, we did not particularize to that extent. We were simply to say when the people inquired as to the water that they could get water for domestic purposes in wells anywhere along that country by simply sinking those drive wells, and especially in the Arkansas valley. I don't remember that I ever made any particular point in my literature about there always being high water at some time during the year and generally in the months of May, June and July. I suppose it is to be taken for granted that that country would be a desert if there was no water there. It must have had water there, from my experience, to keep the crops growing, and I presume that this water came from above in the valley.

3075 I have not made the water supply a very deep study at any time during my work on the Santa Fe road. A great many
3076 of them who went out there west of Dodge City were obliged to abandon their farms because they couldn't raise sufficient crops.

The high waters that I spoke of as coming from rainfall may have come from rain storms up above Larned. There are no tributaries to the Arkansas river above Larned, but right at Larned the Pawnee river sometimes carries a great deal of water through the territory north of it. I have seen the town of Larned flooded frequently. As to the source of supply of the June rises I spoke of, the melting snows in the mountains and upon the plains tributary to the Arkansas river causes that.

I didn't know anything of the Bessemer ditch until 1895
3077 when I came here.

Q. Then when you say that the priority of the Bessemer

ditch dates back to 1887, they must have taken it out after the ditches were dug and in operation in Kansas, did they not?

A. Yes sir, there were a great many ditches prior to ours, both in Kansas, I suppose, and in Colorado.

I don't know that we would raise any objection to people going above us and taking out water and appropriating it for irrigating purposes; but it would probably be very hard for the people who attempted to get water above us to really get it. We couldn't make any objection if they would get a decree from the State to take the water. Of course it would have to follow the priorities, and we insist upon our priority, and such a party so appropriating water must take what is left and not take ours. In addition to that I may say that even earlier priorities than ours below us have frequently a very hard time to get the water they are entitled to, because it doesn't seem to reach them, owing to the sandy condition of the river
3078 bed. That is presumably one of the reasons why the Bessemer ditch has frequently been under suspicion of stealing water, which is almost an impossible thing for us to do. We would get the water we are entitled to and let the balance of the water run down the river, and if it did go down the river the ditches below us would get their water; but notwithstanding the fact that the water goes down through this city and down the river, it frequently does not reach their headgates. I think there is sufficient water in the river to supply the needs of those ditches, but not their desires; that is, we could irrigate more land if we had more water. If we had more water I think we could irrigate a great deal more land, and there are times during the season when some ditches don't get as much water as they really need, because their appropriations of water are too young and other ditches have prior rights to it,
3079 and because of lack of water. If there was more water we could come more nearly supplying the real needs of the valley. It is my view that it is a wise thing to conserve every drop of water in the Arkansas valley that can be properly and legally conserved and applied to that use. I think it would be a very desirable matter from the standpoint of national economy if we could retain all the flood waters that come down this river in reser-
3080 voirs. I don't know from my personal observation of any reservoir sites, but I learn from reports from other people that occasionally say that they know of a place where water can be impounded properly and without too great an expense.

I don't think it is always necessary to have a reservoir right near the ditch which it supplies if there are means of carrying the water. They may be divided by a great many miles profitably, and they are so divided. That is practiced right here in one very noted instance in Colorado. The Twin Lakes reservoir is something like one hundred and fifty miles above the Bob Creek ditch, which
3081 it supplies. The State engineer claims to have found a just ruling as to the amount of seepage and evaporation so as to estimate the amount of water that you may take out and give the

amount that is turned in. The estimates of the engineers vary in respect to the amount of water that is lost by seepage and evaporation and vary all the way from five to fifty per cent. for a given distance. There can be no objection to having the reservoir up the river from the canal which it supplies if they have means of carrying the water to where it is needed, from the reservoir.

We have reservoirs in the eastern part of the State and extending into Kansas that are entitled to the waters from floods only, and so far as I am informed they have never yet secured sufficient
3082 water for their reservoirs to make them of use for irrigation.

I don't know myself, of any authentic report or any careful survey made of the Arkansas river from Garden City, for instance, to the foot-hills of the mountains to ascertain the amount of water and the available reservoir sites and the number of acres of irrigable land yet to be brought under irrigation. I believe it would be to the great advantage of this State as well as of other States to have such a survey made.

Redirect examination.

By Mr. HAYT:

In regard to the circulars and advertisements to induce settlers to come into Kansas, which we sent out, and particularly directed to the water supply, I would say that we referred simply to making drive wells, as we called them. That was the main feature we kept before the people in reference to their getting their domestic water supply; and as to the maps referred to, they were usually
3083 based upon the Government survey and maps, even to that extent that sometimes according to the Government survey the south bank of the Arkansas river would run across the north bank of it; and we made no effort or attempt to show the river to be other than it actually appeared to be. We had to get the map out very carefully because it affected the acreage of the tracts of land through which the river ran. I don't know that we ever dwelt upon the underflow as an argument, and as to the question of sub-irrigation, that never entered into our work so long as I was with the Santa Fe road, nor did I hear it mentioned in those years by anyone, and not until quite lately. Since I have been in
3084 Pueblo an attempt has been made at sub-irrigation.

Those settlers who preferred to locate upon the uplands, got their domestic water by drive wells as well. After settlement became dense a great deal of the water that fell from rains back in the high lands was retained there, but before the settlement the water would rapidly flow away through the draws into the river and very little of it at that time sank into the ground, but some part might have, because it always refreshed the growth of the vegetation. I think that generally flowed into the river. The soil before the ground was being cultivated was pretty hard and tough and it would be difficult for the water to penetrate it. The water that fell

upon the sand hills south of Dodge would sink into the
3085 ground, of course, and I think that went to supply the ground water of the country. I don't know as a matter of fact whether the level of the water away from the river was lower than the water in the river. (Objection.) The source of the water about Larned and below—although I had never seen the Rocky mountains at that time—I stated came from the melting snow, and I added, too, that it must have come from the melting snow in the mountains and upon the plains; and they had rains, of course; but the
3086 spring water presumably came from the melting snows.

Redirect examination.

By Mr. ASHBAUGH:

The western part of the land in that whole country along the Arkansas river was very hard on top before it was broken up. Buffaloes had been ranging over it for ages, and it was so hard
3087 that water could penetrate it only to a slight extent. After it was broken up very much more rain would be absorbed by the ground than before the sod was broken, and before the sod was broken very much more of the rain that fell in that country would run right down along the sod and into the river than after the sod was broken.

3088 HARLEY SANDERSON, Pueblo, Colorado.

Direct examination.

By Mr. DAWSON:

I am seventy-eight years of age and live in Pueblo and have lived in this locality since 1871. I am a brother of the Sanderson who in the early days ran the stages across the plains, the firm being known as Barlow & Sanderson. I had occasion to be on the Arkansas river in Kansas in 1866, and we ran from Junction City up the river as soon as we struck it to Bent's old fort and there left the river and went south. I was there from July until the next April. We
3089 moved onto that road in July, 1866. We were making trips up and down the river between these points, and I went over that road during that summer a number of times, staging. The river was dry in a good many places that year. There was no water in the river. And I can tell you there was no Bent's then. It was all Indians then, and we had to—the stages as well as freighters had regular watering places where we camped. There were no buildings. We carried our own "grub" and cooked it at those watering places, and you would see riding along on the stage any number of dry places in the river, that is, where there was no running stream—dry sand. There was no time during the summer when from rains or other causes there would be a flowing stream while I was there.

I came onto the river, as you might say, in July, and from July until the next April there was no running water all the way down the river. I have had no opportunity to observe it since 1866, as I left there entirely.

Cross-examination.

By Mr. ASHBAUGH:

3090 We crossed over from Junction City to Dodge City, and I didn't mean to state in my direct examination that I came up the Arkansas river all the way from Junction City. There was no high water in July, 1866. I don't know whether there had been before that or not. I don't know anything about the river only that summer. I never tried to dig for water in the sand. There was water in places—holes or ponds—where we and the freighters stopped.

3092 WILLIAM A. WATSON, Pueblo, Colorado.

Direct examination.

By Mr. DAWSON:

I live in Custer county, just west of the Pueblo county line, and have lived in this part of Colorado since the 6th day of June, 1863. I came here from Missouri overland, by ox team. I came in the spring of 1863 from Kansas City and struck the Arkansas river where the old Santa Fe trail intersects the river, I think some-
3093 where below Great Bend, and from there we followed the course of the river in coming up, in the month of May, and we reached Pueblo on the 6th day of June. The flow of water in the river for some one or two hundred miles west of the point where we struck it was very low. We found stretches of the river where there wasn't any running water on the surface. We would strike pools along there that there would be water in and other places there wasn't any, but we struck a constantly flowing stream at old Fort Lyon, and from Fort Lyon to Pueblo, so far as I saw
3094 the river, there was a constantly flowing stream. I haven't had as good an opportunity to observe the flow of the water in the river in Kansas since that time as I had that year, as in making trips in late years I go on the train.

I have been engaged in the range and cattle business in Colorado for forty years, and am still so engaged, having ranches of cattle in Custer, Pueblo and Fremont counties.

Cross-examination.

By Mr. ASHBAUGH:

I believe the year 1863 is considered a dry year. There were dryer years, according to my understanding, than 1863, one
3095 being 1881. I don't know anything about 1860. I think 1863 was dryer than 1864. There was a good deal more rain

in 1864. We found plenty of water up the river at Fort Lyon, and I supposed it came from the mountains, and I supposed if it didn't go down into Kansas it might have sunk into the sands. I think it did sink into the sands. I didn't see any other visible place for it to go.

Redirect examination.

By Mr. DAWSON:

3096 I have held the office of county commissioner in my county. I saw the Arkansas river earlier than 1863. I was on it during the month of July, 1862, and the month of October I was on it from the old Aubrey crossing down to where the Santa Fe trail left it. I think this point is somewhere below Great Bend. During the month of October as we went back up the river it was comparatively dry in that section of the country. We found places where
3097 there was no surface stream flowing. In July, however, there was a pretty fair flow. There are no other years in which I was familiar with the Arkansas river in Kansas and its flow.

Recross-examination.

By Mr. ASHBAUGH:

By "a pretty fair flow" in July I meant to say it seemed to cover most of the sand bars. I couldn't say how long that high water lasted. I was on the river principally for the month of July and the high water lasted all the time I was there.

3098 HENRY H. BOURNE, Pueblo, Colorado.

Direct examination.

By Mr. DAWSON:

I am sixty-seven years of age and reside now in Pueblo. I came first on the Arkansas river in about 1873. I was along the river at different places from Wichita west clear up to the Tennessee pass, and every two or three years, I can say, and sometimes every year, I travelled up and down that river for the Santa Fe road and the Rock Island road, prospecting, for as much, I guess, as twenty odd years. I first commenced working in 1873 for the Kansas
3099 Midland, which was afterwards sold to the Santa Fe. I was employed as chief engineer to prospect for anything that would make freight for the railroad, such as building stones, clays, etc., and gave my attention mostly to clays, limestone, coal and cements, and have been engaged in looking after cement property in this State. I was connected for a while with the Portland cement works in Fremont county, and I was engaged in principally the same business for the Rock Island road as for the

Santa Fe. There was one year that I remember well between 1873 and 1878 when I was prospecting from Great Bend along up as far as Garden City, I think to a little town called Aubrey. That
3100 was before the railroad was built. And right along there I either rode or drove with a buggy in the bed of the river. I was examining the banks on each side nearly all day, and there was not a bit of water in it. There were a great many times between 1873 and 1885 that I had occasion to go along the river, and there was one time when I was working for the Rock Island, the year it was built into Fort Dodge or the year before, that there was a man taking out a large ditch there in the sand below the bed of the river about fifteen miles this side of
3101 Dodge City. There was no water in the river, and still there was some water in the ditch. I drove from Arkansas City up the river at one time with my wife and there was not a bit of water all along in Kansas, and when we got up near Salida and up there there was plenty of water in the river. We remarked it how much water there was up there and there was not a bit in southern Colorado and Kansas.

Cross-examination.

By Mr. ASHBAUGH:

The first time I saw the river was between 1873 and 1876, and it was a dry year. The grasshoppers were there about that
3102 time. About the same time I was up on the Republican river, and I think there was water in it. I don't remember now just exactly. I am not sure. Because it was very seldom that the Republican river ever went dry. I couldn't tell what time of the year it was that I drove up the river as I stated, but I think it was along in the fall of the year some time. I don't know
3103 how high the water had been in the spring, but I have seen it outside of its banks many a time. I think I have seen it out of its banks from 1873 to 1876, but I couldn't tell how many times, but I suppose half a dozen times within the last twenty-five years, both in Kansas and Colorado, and I have seen it out of its banks there along about Aubrey and Fort Dodge and along
3104 in there. Aubrey was where Kendall is now. I couldn't tell you how far the river got out of its banks at the times I saw it, but I have seen it out of its banks many times at different points along the river, and at different intervals, both in the spring of the year and later in the season when there would be big freshets, along in May and June, and July sometimes. These places where I have seen it out of its banks were above Larned, and also away down farther. I was at Wichita about 1873. I saw the river up
3105 many a time at Wichita, and pretty low too. I don't know whether I have seen it dry there or not. I wouldn't say that I have. I think I have seen the Little Arkansas river dry, maybe

eight or ten years ago. I may be mistaken as to the name of
3106 the stream, but the one I refer to was up north from Hutchinson. I don't think I ever saw Cow creek dry. I have been on that a good many times and there was always water in it. I may be mistaken, but my recollection is that I have seen the Little Arkansas dry above Hutchinson.

The ditch that I referred to was a big ditch that some man was taking out as an experiment. He had some reservoirs there. He was going to a great deal of expense, it seemed to me, at that time, to take the underflow from the river. I can't give the length of the ditch, but I think it was out anyway a mile and maybe more. I was just at the head of it. There was a reservoir at the head of it and another near or below it. He dug a big reservoir and
3107 found water there and ran the ditch down farther. I don't remember how much water there was in it. The experiment was as to whether they could find water there in the valley and whether they could make a success of that. I never followed it up to learn whether they made a success of it or not. They found water there and it didn't come from the river directly; it came from the underflow, that is right.

3109 S. S. SMITH, Pueblo, Colorado.

Direct examination.

By Mr. HAYT:

I have resided in Pueblo since 1860 and first saw the Arkansas river in 1858 when I was coming out to this country. I think we struck the river first at the Cimarron crossing. I think there were two crossings there; one was called Aubrey and one the Cimarron, and I am referring to the upper crossing. I was along the river again in 1859 and 1862.

3110 We started to come to this country in 1858, and I got out as far as the Cimarron crossing and concluded I would go back, and then in the spring of 1860 I came out again, and on those two trips I saw quite a number of places along the Arkansas river, and in after times we were going down buffalo hunting at different points along the river. There was no particular place, but we would go along until we struck some buffaloes. There were no settlements in those days. We started in about Rocky Ford, and from there on down the river until we struck buffaloes. Sometimes we struck them quicker than at other times, and we went down as far as
3111 Dodge City, or rather Fort Dodge, as there was no Dodge City then. We could go down, I expect, a hundred miles from Rocky Ford if we didn't strike buffaloes before that. Sometimes we would and sometimes we wouldn't. We were in the habit of camping along the river during these hunts. It would depend on how far we went as to how long we stayed. Time was nothing to us and we paid no particular attention to it.

In 1858 when we struck the river at Cimarron we camped there. When I got aboard the stage we had to dig quite a little bit to get water enough for the teams. Then they ran the stage from Fort Union to Council Grove, and as they had to carry along extra animals the consequence was they had quite a number of them and there was not enough water for them anywhere we could find, only to dig a hole. I know that because we camped there that night and waited for the stage to come in. These holes were dug in the sand in the bed of the stream.

3112 Q. There was no running water in the stream, as I understand?

A. Yes, at that place.

In the years 1859, 1860, 1861 and 1862, as a general thing the water would be pretty low in the fall, say from August to September, or may be into the next month, and there was often not a bit of water only in pools. Once in a while we would strike a place where there was water, but as a general thing there wasn't any in the river. There were a good many places there where there was water in pools, and then again there wouldn't be any and we would have to go too far or something of that kind and would have to dig. There seemed to be always water in the bed of the river if we could dig down to it. I couldn't say how far we travelled at any one time without finding running water. There were no settlements down there and we were just roaming along and sometimes we would

3113 make longer journeys and sometimes shorter ones. When we would strike a place where there was water, time was nothing to us. We would camp and hunt buffaloes, and as soon as we got a load we would come home. We arranged our camps with reference to these pools.

I was down there again some time in the '60's, but I am not certain about the year, and that is about the last buffalo hunting we did. On the last trip that I made we went over to Kit Carson when they were building that railroad. I think that was in 1871. That is the last time. The last trip we made we went down the river some considerable distance to get water and camped there until the next day and hauled the water out with us going over to Kit

3114 Carson because there is a desert between those points. We went down the river a considerable distance to find one of those pools. In doing so we drove right along down the river. We had been at Las Animas, and there was a little water there, but where we left the river about twenty miles below Las Animas there was not a drop of water.

Cross-examination.

By Mr. ASHBAUGH:

It was about the last of September, 1858, that I was at Cimarron crossing when I didn't find any water in the river. I was

3115 there again in the spring of 1859 and there was very little water. I think that was in April. I got to Pueblo on the

25th of May. We went down to hunt some buffaloes, and we got buffaloes and found places where there was running water and found some places where there was no water. I was not there in May, June or July during the period when the usual high water went down the river. I know there was high water here at Pueblo.

Where it went I couldn't tell. I don't think I ever saw any
3116 high water in Kansas. I was not there, perhaps, when the high water would get there, but to my knowledge I never saw any water to amount to anything running in the Arkansas river in Kansas. When I was there I was there in September and in April, and you can draw your own conclusions.

ROCKY FORD, COLORADO, Dec. 16–17, 1904.

3117 WILLIAM G. GOBIN, Rocky Ford, Colorado.

Direct examination.

By Mr. HAYT:

I am thirty-nine years of age, and a lawyer, and live at Rocky Ford, in Otero county, Colorado. I lived in Kansas from 1877 to about 1884 or 1885, and have lived in Colorado about eighteen years. In Kansas I lived at Wichita and Cheney. I was a farmer then and did some freighting. Cheney is about twenty-six miles west of Wichita, and during those years I passed over the territory from Cheney to Wichita quite often and had an opportunity to see the Arkansas river in that vicinity. I was engaged at one time in running a ferry over the North Minnescah river at the point where the town of Marshall once was. That is about twenty-six miles west of Wichita. I ran this ferry during the years 1878 and 1879 or 1879 and 1880, and the river was usually up in those years in April, May or June. I lived in Wichita from March 9, 1877, to April,

1878. I was a boy in those days, and I used to fish, but I
3119 never attempted to do so in the Big Arkansas, as we call it, except in flood times. Sometimes there were floods. In the Little Arkansas, however, I got a number of fish. In flood times, in May or June, there was a great deal more water in the Big river than in the little one, but I think, taking the year round—I know there were seasons of the year when the Little Arkansas apparently had more water in it than the Big Arkansas. I remember that the Government had attempted, apparently to make the Big river navigable, or else some individuals. It was reported that the Government had, and there were willow dams placed in the river diagonally so as to have a tendency to confine the channel, and I think

in dry periods I have seen that channel as narrow, when the
3120 river was confined, as thirty feet, with probably six inches deep of water. I was more or less familiar with the river from 1877 up to probably 1885, and there were seasons when a great deal of rain, and in those days all the streams, including the Arkan-

sas river, would be up. I have seen it when it was impossible to cross. For instance, in one season I remember the bridge was torn out and it was impossible to cross and we waited several days before we could ford it. At the same time all streams from there west to Kinsley, including the Ninnescah and various creeks, were in the same condition, and then probably there would come along a dry season when all the creeks would be practically dry and the river would be very low, as low as it was in 1877.

In speaking of the dry season I don't mean that it occurred every year. The really dry year, if I remember right, was 1882—along in that time. That year I found all of those rivers practically dry; and then going back there in 1900, 1901 and 1902 I found there had been moisture and those streams were running again. The
3121 Arkansas river was running a stream about like I saw it two years before. I didn't notice much difference in the flow of the water between those earlier years from 1877 to 1888 and the times I saw it in 1901 and 1902, with the exception of those streams west. Now, when we first moved to that country the banks of the stream seemed to be more abrupt. The prairie at that time was unbroken. It was covered by very heavy sod and all buffalo grass and blue-stem, and it seemed to me as the land became cultivated it became sandy. There were sandstones and small streams—creeks—running into them. It seems like those streams west, such as the Ninnescah, have filled up several feet. I think that was caused by this cultivation, the land being cultivated and wind storms blowing the sand into them, and also loosening up the soil so that the water would wash it in. But this Ninnescah river seemed to me like it was filling up. It seemed to me that there was not near as much water flowing on the surface in it as there did before. The sands coming into these side streams were carried down into the main river and filled it up. To illustrate: In an early day I know there were holes in the river. Very deep holes. And at places where the creeks emptied into the river there would be very deep holes, as deep as twelve feet, what we used to call duck ponds, and now it is all level and full of sand and the whole river seems to be level and full of sand. In 1893—it was during that dry season at least in Kansas—I actually saw sandstones right in the bed of the Ninnescah river and not a particle of water was flowing. That is the North Ninnescah.

3122 I was down there again in 1902 and it seemed to be a wet season and there was a great deal of rain and the river was flowing again. However, it didn't seem to flow like it used to; that is, it was a level sand bed. The water was flowing around through the sand where it used to have a more direct channel before it filled up. The Ninnescah rises somewhere in the sand hills south of Garden City, I think, and there is no irrigation along it so far as I know. During the years between 1877 and 1885 I was fish-
3123 ing along the river at times and frequently crossed it and recrossed it in my bare feet. I was a boy and could cross it

anywhere. The fishing I did was principally in these holes. The rise in the river seemed to be caused by rainfall, and I heard it mentioned in those days that it was caused by melting snows in the mountains in Colorado. I think they considered it rose from both causes, but that coming under my direct observation was from rainfall in that immediate vicinity.

We located in 1878 between the North and South *M*innescah rivers. Those years were yet. If I remember right 1878
3124 and 1879 were very wet. I remember this prairie became so saturated with water that a horse couldn't be ridden over the land without in the depressions he would sink into the ground, so that I was compelled to carry a twenty-five pound sack of flour home three miles because it was not safe to take a horse on the prairie. At that time we had a well that was dug at sixteen feet deep and the water came within eight feet of the top. After these dry periods came on—I think it began to get a little dryer and dryer after 1879—the water began to sink in the well and we finally dug that well to a depth of thirty-four feet before we got sufficient water for our stock; and as the water in the well went down the creeks dried up and the river dried up and it continued in that way for several years. It being very dry, we raised very poor crops. Then there were several years when there was a little more moisture; and then the water would rise in the well; but we never dug deeper than that. When the water would rise in the well rivers would have more water. I noticed in 1901 and 1902—I was down there both times—the water again had risen to about its original *ex* level and the streams seemed to be about the same, with the exception that they were filled up with sand and the flow was not as
3125 swift, apparently, and the channel was not the same as it was before. The variation of the water in that well between those periods was about twenty-four feet between the extreme low time and the extreme high time. Land has become much more valuable and more productive there, in later years as compared with earlier years. I don't know whether it is more productive or not, but the people are more prosperous and land is much more valuable than it was in the early days. To illustrate: In 1884 I bought eighty acres of land, although I was a boy, for $400. It was bought in my father's name. In 1902, I believe it was Walters who bought it, and paid $1800.

I think the water in the wells and in the streams in that vicinity depended upon local conditions as to the rainfall. (Objec-
3126 tion.) That is the conclusion I meant to be drawn from my statement. (Objection.)

Cross-examination.

By Mr. ASHBAUGH:

I went to Wichita first on March 9, 1877. I don't think
3127 there was any particular high water in the Arkansas river then. I don't remember any particular flood at that time.

There was one year that the Little Arkansas river flooded over the city of Wichita it became so high, but this flood was not in the Big Arkansas river. I didn't notice whether the flood came down the Big Arkansas and backed up the Little Arkansas and then
3128 overflowed the town. I never went up to the bridge when it flowed down. I wouldn't testify, however, that it wouldn't. I don't believe there was any year during my residence in Wichita but what at the lowest stage of water the river became as low as about thirty feet wide and six inches deep. There was a bridge across the river at Douglas Ave. when I was there. It was a wooden bridge. They have built a new one now. I don't remember when that was built, but it was built after I came away. The new
3129 bridge was built after 1885, I think, or else it was repaired. At any rate it don't look like the same bridge to me. The old original bridge was pretty nearly washed out at one time by a flood. I know we were compelled to ford the river for quite a while when we were freighting. I think the present bridge is a wooden bridge, but I have not crossed it, but I crossed on the railroad bridge below and looked up that way. Whatever kind of a bridge is across there now I think it was built after 1885. It was made over anyway. I don't think there is much differ-
3130 ence in the width of the banks. They have filled in some on both sides apparently. I have seen the time in those earlier years when there was more water in the Little Arkansas than the Big Arkansas, I think every year. I don't know how big a river the Little Arkansas is. Where I used to wander along the river the bank was all on the south side, along where that bed caved in. The Little River was fifty, one hundred or five hundred feet wide, either one, just as you want to call it. I think I have seen the Big
3131 Arkansas river thirty feet wide and six inches deep below the mouth of the Little Arkansas, and I think that very year I was there it got that low.

Referring to Complainant's Exhibit A–1, I would say that it doesn't look to me like the old bridge. It might be if it was worked over. That doesn't look to me like the bridge that was over the Arkansas river in Wichita in 1877, but it might be. I
3132 wouldn't be positive. Exhibit A–1 shows the river at a high stage of water. I notice those braces at the lower part of the bridge, and these are the bottom braces shown there. I don't know how far it would be from the surface of the water as shown
3133 by these lower braces up to the bridge. I don't think the bridge was as high as fourteen feet above the surface of the water at high water in 1877 to 1889. I don't think it is over six or seven feet from the lower part of that brace up to the bridge as shown in that picture.

Examining Complainant's Exhibit A–2, that bridge was built after I left there in 1885, if that is the Douglas Ave. bridge. Here is all I say—I don't know this bridge shown in Complainant's
3134 Exhibit A–2. I don't think it was there in 1885. I don't

think that bridge shown in Exhibit A–2 was there in 1879, 1880 or 1881 nor in any year prior to 1885.

Referring to Complainant's Exhibit A–3, I don't recognize it. It might be the Douglas Ave. bridge at Wichita. If Exhibit A–2 is a photograph of the iron bridge across the river at the foot of the Douglas Ave. bridge in the city of Wichita, built in 1879, and
3135 Exhibit A–3 is also a picture of the same bridge, then I was mistaken about it. The old bridge as shown in Exhibit A–1
3136 is coming back to me. I think that old bridge looks right, but it is high water, the way it looks to me. It seems to me that during the flood of 1877—I know the bridge went out—it seems to me it was washed out several times. I would swear that that bridge was washed out during its history; that is, if this is the bridge on Douglas Ave.—at the end of Douglas Ave.—and that remained there from the period of which I am testifying—several bents have been washed out at different times, yes sir. I saw the flood of 1877. I don't think it came any nearer the bridge than is shown in Exhibit A–1. Not much. The water seemed to be within five or six feet of the bridge. It was very high. I think that flood came within six or seven feet of the bridge floor. I don't think it came within two feet of it. It might have. I was
3137 not down there all the time.

Examining Complainant's Exhibit A–41, it might be the Douglas Ave. bridge at the city of Wichita. I don't know about the water there now being high water. There seems to be
3138 some water under the bridge. I can't state whether the water as shown in Exhibit A–41 is higher or lower than the water as shown in Exhibit A–3. I wouldn't say. In Exhibit A–41 it doesn't show a river to me at all. It don't show the channel of the river. I am not really familiar with the bridge. These abutments look like stone. It looks like some old broken piling there.

3139 Referring to Exhibit A–3, I have seen the river when it looked as high as there shown. It looks reasonably high. It is not high water, but it is higher than usual. The sand bars shown in the river when it is higher than usual. They show in all stages. I have seen that river when it was as much as half a mile wide, and the sand bars then showed in some places in some islands down there. The sand bars don't show right in the river when it is at high water. The water as shown in Exhibit
3140 A–3 is medium.

I used to think the North Ninnescah in the early days was the larger, but I believe now that the South Ninnescah runs more water. The South Ninnescah gets its supply somewhere in the western part of Kansas, in various streams; but I never was at the head waters of the South Ninnescah. The Ninnescah at Pratt Center is a very small stream. The ferry I had was across the North Ninnescah. I don't think the South Ninnescah has decreased

to the extent of the North Ninnescah. I never saw the
3141 South Ninnescah dry, and I never heard of it being dry. I have seen the North Ninnescah dry so it didn't flow. The
3142 North Ninnescah flows between the South Ninnescah and the Arkansas, and the Ninnescah river is naturally higher than the Arkansas river. I don't know that during the dry seasons the South Ninnescah flows as certainly and almost as high as when it is a wet season. Take the dry years of 1893 and 1894, it flowed a very nice stream, and always did.

By referring to the railroad map just handed me I notice that both the North Ninnescah and South Ninnescah rise pretty
3146 nearly together; they are not very far apart. In speaking of the land around Cheney I don't suppose it is more productive now than it used to be. I didn't mean to say that the value of land has gone up because of its recent productiveness. The farming is much more thorough and systematic than in the early years, and the farmers have become richer and have more machinery and do a better grade of farming than when I went to that
3147 country.

Redirect examination.

By Mr. HAYT:

I was twelve years of age in 1877 and I didn't pay much attention to the bridge, I believe if I were to go there now and look it over I could tell; but the more I look at counsel's photograph the more plainly the old bridge appears to me, although I never thought I would be questioned about it, but the more I look at it the more it comes to me that I have seen the bridge a number of times; but the photograph was taken in an opposite direction, I think, from what I looked at the bridge. I frequently waded across the river, fishing back and forth, in those early years, and I used to play on the sand bars down there along the river, but I hardly know whether that is an iron or a wooden bridge. As I say, I looked at it from a livery stable there at the end of the bridge, and also was over at the ice plant to get some ice, with my uncle, on the west side. I didn't cross the bridge, the way we came down there. We went clear back to Cheney on the railroad, and then he drove in with his wagon from Cheney for a load of ice, and I saw the bridge from that direction—the new one—but didn't pay much attention to it, and I don't know whether the new one is iron or wooden, nor do
3148 I know the year in which the new bridge was constructed.

I never saw or heard of any irrigating ditches taking the waters from the Arkansas river.

3151 H. M. FOSDICK, Rocky Ford, Colorado.

Direct examination.

By Mr. DAWSON:

I live about eighteen miles west of Rocky Ford, at Fowler, Colorado. I am fifty-five years of age, and am in the range stock business and farming. Fowler is on the river. I saw the Arkansas river in Kansas in 1861. We came to the river from Lawrence with our teams on a publicly travelled road after passing Cow creek. It might have been at Great Bend or it may have been at Hutchinson or somewhere along there. I think it was in the month of
3152 April. And we came on west from the river at that point. As I remember, it was quite a stream in April and early May that year, at least there was a running stream. I saw the river in Kansas again in the year 1870. From the State line I travelled down the Arkansas river as far as Wichita, leaving here in November. The water in the river got less as we proceeded down. It was remarkably less until we got, I think, to Cow creek; then it was some larger. There was more water in it, but it was remarkably less than it was up here. I was born in 1849. In 1869 I was 20 years old and in 1871 I was twenty-one, and that fall I left home, and that was the year I was on the river. I remember we wondered why the water got less in the river as we went down. The buffalo were down there then and we had great hunting with them, and we would run in there and wade the river. We would walk across the river. We couldn't pretend to do that up here and we did down there. That is about all I can say.

3153 I crossed the river with cattle coming from Texas in 1871 at a little village called Park City, a few miles west of Wichita, ten or twelve miles, as I recall. We crossed there and followed up the river. That was in August or perhaps the latter part of July. There was some water in the river for cattle where we crossed. Plenty of water for the cattle. As we got up farther the water got less. I think after we left Cow creek there was no water sufficient to water the cattle. There was no running water except, as I remember, at Walnut creek. I think that was its name. It came in there and flowed a little water; but that soon lost itself in the sand after it got into the Arkansas, and there was no water in the latter river except in deep holes, and it hadn't the appearance of having had any water, because I recollect we found one pool, perhaps as large as this room, and it was filled with cat fish.

3154 Those were the first fish we had. We came off the range, coming up the trail, and had nothing but bread, beef and coffee. When we found those fish we lit onto them and gathered boxes full, and they made everyone of us sick. They were diseased fish. They were in hot water. I recall that very well. There were stretches along there where there was no flowing water, from

this last creek, the Walnut I think it is. That is about old Fort Larned. There was no flowing water from there to Fort Dodge. That creek may be the Pawnee instead of the Walnut. Anyhow it is the creek that comes in near where Fort Larned was then. My recollection is that we found that dry condition of the river, without flowing water, for about fifty or sixty miles, and we came on up into Colorado with the cattle. At the point where we first got into Colorado we had no water for a number of days for the cattle. They were suffering very much. At Dodge City the cattle ran
3155 right off to the river and went into swimming water. They fell over the bank into water and swam. It was full of drift and foam at that point. There was a big rise out here somewhere. That was in August.

I was on the river in 1863. That was a dry year. I didn't go into Kansas, but the river was very low in Colorado. I was at Booneville, it was called then, but was not down on the eastern borders of Colorado. There was a very small flow of water in the river that year. I waded it with my boots. I think it was in 1881 at Granada, near the State line, at the crossing at the railroad and wagon bridges, I drove in on a road there over to the river and noticed as large a flock of ducks as I ever saw, and there was not water enough for them to swim in at the bridge, but they were
3156 strung up on the sand bars as thick as they could be. I had a .45 revolver and I walked right down and squatted down and when they raised up I killed seven of them with one bullet, and there wasn't water enough to float them, clear across the river. The river was perhaps sixty or a hundred feet in width, but there wasn't water enough there to float those ducks, not one. I remember that circumstance. They would have to wade if they went into the water.

I have noticed the effect the irrigation of lands about Fowler and and this country about Rocky Ford has had upon what was formerly the dry arroyos or waterways that lead toward the river. I think I am now using one hundred and fifty inches of water that is seeped water. It comes out of the ditch. We dug the ditch in 1865 and there was a very small spring, it would perhaps afford a bucket of water—eight or ten quarts—in a day at that time, and that continued from 1865, every spring we would see that little spring when we cleaned it out. Well, after the Oxford ditch was built I kept that ditch in repair up to 1887, then the water began to increase. In 1888 there was considerably more, and in 1887, I think, the Arkansas river cut the head of our old ditch out that was constructed in 1865 and I didn't repair it that year. The next year it occurred to me that I might not be compelled to. There was a good deal of water
3157 coming over the shale from the ditch from the lands irrigated above, and I think at this present time—well, I have a flume two feet wide, and it has quite a velocity—quite a fall—and very often I have it just full. That is a twelve inch plank, probably ten inches wide; and every drop of that is seepage or return water and

came since the Oxford and Highline ditches were constructed and the upland had been irrigated. I have noticed other arroyos or cuts lying under irrigated lands in many places, but since the water was taken out. Why, anybody knows that. The flow is increased very much in fact in many places now since the irrigation occurred
3158 there is lots of water where there was no water before. All of the lands irrigated by the water from the Arkansas river in the neighborhood of Fowler and Rocky Ford within the drainage area of the river are so situated that the seepage or return water will naturally return to the Arkansas.

Cross-examination.

By Mr. ASHBAUGH :

We left Lawrence, Kansas, on the 4th of April, 1861, and came right out with our ox wagons and struck the Arkansas river during the latter part of April. We found quite a stream then. We went up as far as Pueblo and we found quite a stream all the way along. I don't remember how deep the water was in the river, but I should say a foot, and in some places two or three feet deep. At some bends it may have been two or three feet deep, and anywhere from fifty to a hundred feet wide, I should say, and in some places more than that.

3159 I don't remember how wide the river was between the banks at the place I first struck it, but I should think two or three hundred feet, and the water spread out half of the way in some places. I went down the river from the State line to Wichita in November, 1870. November is not always one of the low seasons of the year for water. The lowest season varies. If we have fall floods we have a pretty good flow of water in October, November, December and January. If we didn't have the late summer or fall floods in August and September—and we don't always have them—the river will get lower and remain lower. I should think
3160 that August and September were the lowest months for water in the river. We found less and less water as we went down the river until we struck Cow creek, but what became of that water I don't know. It didn't go out on the land; there were no ditches there. It sank into the sands. We got water for our horses and our camp at this particularly dry time in August, 1871, by digging for it, perhaps a foot. I brought some cattle up in 1871 and struck the river at Park City, which was a rival town of Wichita, and crossed it at Park City. That was on the old Chisholm trail,
3161 which went up to Newton and Abilene. I think I remember and talked with Mr. McCoy who operated that trail. I am not sure about it at that time, but I think I have met him and talked with him since. When we came up the river with those cattle from Park City we found some places where there was no flowing water, and then we found a place where the cattle had to
3162 swim. That was right in the bottom below Fort Dodge We camped at about the end of the Government reservation

We had 2,700 head of cattle there. There is a little creek there known as Coon creek, but I don't remember of that having any water in it at all. I know there was no running water in it. It follows right along the river. The water where the cattle swam must have been five or six feet deep, right up to the bank. I don't know how long it lasted, because we had water then and we were not worried about it. Of course we didn't have that big flood more than perhaps a day or two. I don't remember that, but I remember the cattle coming into that swimming water; and then we had
3163 plenty of water up here to Colorado, and from Dodge City up. I don't know what the condition of the water was up there above Dodge City before that flood came.

After I dug my ditch in 1865 I didn't notice any seepage water from it for a number of years. It takes a good while for water to seep through the land so as to be noticed in the arroyos that were dry before. You see that was right close to the river and there was no opportunity for the seepage water from that to appear. The Oxford ditch, I think, was constructed in 1887 or 1888, and perhaps it was within a year after that that the seepage water appeared. It was more than a mile from the ditch where I noticed the water, and if it came from the ditch it passed through the soil at the rate of at least a mile a year. If it didn't come from the
3164 ditch it might have come from the irrigation of the land between the spring and the canal proper. I haven't any idea as to how fast water goes through the soil, neither have I any idea as to what proportion of the amount that is used in irrigation becomes seepage; and I have made no observations that I would like to put into the record.

3165 J. W. BEATTY, Rocky Ford, Colorado.

Direct examination.

By Mr. HAYT:

I am sixty years of age and live at Manzanola, ten miles west of Rocky Ford, in Otero county, Colorado, and I do a little of everything—farming mostly, I reckon. I have resided in Otero county since 1869 and first became acquainted with the Arkansas river in
3166 1863 at Pueblo. I never was down farther than Lamar, Colorado, in that year. In 1863 I was in the Government employ, driviug a team. We started from Pueblo and drove as far as Lamar, Colorado. There wasn't anything down there only Government headquarters at Fort Lyon. We left Pueblo in December and reached Fort Lyon some time during that month. I don't remember very much about the river up here, but we stayed there at Fort Lyon for about two or three months and there wasn't so terribly much water there. You could cross it with a pair of boots at Fort Lyon. The way I remember it, we got after a coon

there and ran it across the river. That was the first one I ever saw in a prairie country. It was not boot-top deep across there at Fort Lyon, and probably about seventy-five feet wide. I think
3167 we were there until about the first of March. In 1864 I went down as far as Council Grove. I think it was in May, and we came back about the first of July. There was water in holes in places and in other places we had to dig in the sand to get water for our mules, and coming back, all the way from Fort Larned to the State line, pretty nearly, it was dry, and as we went down there was no running water; it was standing in holes along the banks occasionally. I never was through Kansas after 1864 except on the train. I have been accustomed to using water for irrigation in Colorado for a number of years, and have noticed that almost all these little dry creeks are running streams
3168 now that were perfectly dry before the irrigation. There is one up between Nepesta and Fowler called Chicosa creek. That is running water all the time. And the next one is the Apishipa creek. Well, Timpas creek was a dry creek too before they commenced irrigating; and Crooked arroyo, between here and La Junta was dry, and it is now a running stream. I should think that Chicosa creek was about four miles the other side of Fowler, and the Apishipa is about four miles on this side, towards Rocky Ford. That is about thirteen or fourteen miles from here. The next one will be the Timpas creek, and that is down about five miles east of here; and the next one is about nine or ten miles east of Rocky Ford. It is about three miles this side of La Junta.
3169 I think these streams are running continually the year round, and I expect they run from a foot to five or six cubic feet of water in each creek.

Cross-examination.

By Mr. ASHBAUGH:

I first noticed these creeks begin to run about three or four years ago. None of them showed any running water before three or four years ago, so far as I know.

3171 S. W. CRESSY, Rocky Ford, Colorado.

Direct examination.

By Mr. DAWSON:

I am living at Rocky Ford, Colorado, and have lived in the Arkansas valley since 1891. I think it was 1892 when I came to Rocky Ford. I am water commissioner of district No. 17 in division 2, and held that position from 1895 up to the spring of 1900, and also from 1903 to the present time. The Holbrook canal came about the time I came to the valley, and also the Highline and

Otero canals, also the Bob Creek canal. My district covers all land irrigated taking water from the west line of Otero county to the mouth of the Purgatoire. Under the Fort Lyon canal there is about fifty-five thousand acres under irrigation; under the
3172 Holbrook there is about 17,000 acres under irrigation; under the Catlin in the neighborhood of 18,000 acres; under the Rocky Ford about 9,000. The Otero has had but very little irrigation since I have been here, on account of the ditch being out of repair, and the scarcity of water combined. So that there is very little under direct irrigation under the Otero in the past years. All of this land I have spoken of is within the drainage area of the Arkansas river, and any return waters from irrigation will either go to that river or its tributaries.

There has been a great deal of increase in seepage and return waters all along this district, and that is apparent on the surface in many places. Starting from the head of the Otero canal at Fowler and all along under the brink of the hill or second bottom to the Apishipa there is a great deal of surface or seepage water finding its way to the surface and back into the river. In the Apishipa,
3173 which will drain lands under the Oxford Farmers' canal, and a portion of the land under the Highline, the seepage water will probably amount, at the railroad bridge, from three and a half to possibly ten feet. Across about north from the mouth of the Apishipa there is a ravine running down from the Bob Creek country—I guess they call it the Bob Creek canal now—and there is quite a bit of seepage finding its way from there. There is a pond there and a small running stream, while possibly not longer ago than seven or eight years it was perfectly dry. In the neighborhood of ten years ago in the lands lying under the Bob Creek canal and farther north or in the drainage area of this draw I speak of the underground water stood within a foot of the top of the ground. It has finally worked its way through and has found its outlet in this draw I speak of, so that under the same lands where it was only a foot from the surface it is in the neighbornood of eight or ten feet from the surface now. Farther up under the Bob creek there are gullies that run water continuously, probably a very small fraction of a cubic foot in each one.

Coming down to the Patterson hollow, about four or five miles above Rocky Ford, which drains land lying under the Highline, the Otero and Catlin ditches, there is a constant flow in certain portions of the valley. Above the railroad bridge possibly one half to three quarters of a mile, the waters of the surface are con-
3174 tinually running; then it sinks underneath and goes underneath the surface at the railroad crossing, coming up about a quarter of a mile below the railroad bridge, and there I would estimate there was at least two cubic feet of water; and immediately up from that under the brink of the hill there is another stream with possibly three quarters of a cubic foot.

Passing down on the east of Patterson hollow we come to land

under the Catlin and also under the Rocky Ford ditches, that has become seeped and has been tiled by the American Beet Sugar Company. The different tile outlets on the American Beet Sugar land will possibly run in the neighborhood of two cubic feet of water.

Then we come into the slope of Timpas creek, which drains lands from the Rocky Ford, the Catlin, the Otero and the Highline ditches. There is a small natural flow to that stream above irrigation, which I measured in the neighborhood of a month ago and which runs about one cubic foot of water per second of time, clear above irrigation. At the railroad bridge east of Rocky Ford on Timpas creek, the seepage or return water from natural seepage will run from ten to twenty feet per second. Under the Fort Lyon canal there are numerous places of swampy and low lands that have seeped out east of La Junta. I am not familiar enough to estimate the amount of that seepage.

From the drainage of the Holbrook country into Horse creek, which empties into the Arkansas river, there has been within the last few years considerable seepage water breaking out on the
3175 south slope of Horse creek from irrigation.

I am familiar with the measurement of water, and have a small Price meter, and I have made some measurements and reports of the seepage water to Professor Carpenter, State engineer of Colorado, at different times, and these measurements were made carefully and accurately. The crops raised upon the lands lying under the canals in my district are alfalfa, wheat, oats, sugar beets and cantaloupes, and the market value of the land in this district will run from $30 to $300 an acre. The average value of irrigated lands is possibly $75, and those lands not under irrigation in the same
3176 locality are practically valueless, with the exception of grazing. I don't believe a man can lease for stock purposes and pay five cents an acre for a large amount and make it pay, and it would sell, if at all, according to location, from $1 to $2.50 per acre. If the irrigation were stopped in this district the land would go back to its original state and its original value that I have just spoken of for arid lands. No crops can be grown successfully throughout this district without irrigation. The increase from the seepage and return waters in my opinion is still going on and will continue for several years, as it has been increasing slightly all the time up to the present. If only such an amount of water is put on the soil
3177 as will go into the soil and not run off, the passage through that soil is so slow that I don't know when it would come out, and of course that would come in with the gradual, slow increase in seepage. This seepage water flows in a large measure the year round, and it does that whether irrigation is going on each month in the year or not, and I think this seepage would have a material effect in keeping up the flow of the water in the stream. We take out water from the river not only at low times but when there is lots of water in it, and if we take it out when the river is

running full and spread it over the land it will have the effect of maintaining the flow of the stream during the dry periods, lower down the stream. I am stating this from my own personal observation. In taking certain crops, like alfalfa, I would say that it
3178 returns probably in the neighborhood of three tons to the acre. Sugar beets in this immediate vicinity have run from $10 to as high as $42 an acre; winter wheat has averaged, I think, safely speaking, thirty-five bushels to the acre; oats from fifty to one hundred bushels to the acre; cantaloupes are rather uncertain, but they are a regular and valuable crop here. Cantaloupes have returned up as high as $200 an acre, and possibly some of the early crops more. The sugar beets raised in this district are manufactured into sugar at this point. The company pays to the farmer $5 per ton net; that is, of course, the tare coming out, but regardless of the percentage of sugar; and I think the acreage this last year
3179 was about 12,000 acres in the valley here, coming to this particular factory, and these are treated at this factory. The sugar beets I speak of are raised up and down the valley. I think there is in the neighborhood of 12,000 acres treated at this factory. The Sugar City sugar beet factory gets the beets raised under the Bob Creek canal, as far as I know, entirely, and that canal takes its water from the Arkansas river and is in the Arkansas drainage. Taking the Sugar City sugar beet factory, they probably have in the neighborhood of four or five thousand acres additional. I was not thinking of that factory at the time. The total drainage of all the lands irrigated in my district is back to the river.

My duties as water commissioner commence with the taking out of the water at the headgate. All of the waters taken through these canals are applied to beneficial purposes, or to the growing of
3180 crops. My endeavor has been so far as possible to eliminate all waste, and, with my ditches, to only let them turn in so much water as they can actually use and not run it through the ditch so that they get more water than the individual farmer really needs—to hold them down to an amount so as to prevent as much waste as possible. The water that men are permitted to use depends upon the needs of the crop. The decree does not necessarily indicate the amount of water that is used out of the river. The latter means the most he is entitled to; although at times during the flush season he may run a little more than that, but that season will only be not to exceed two months, and often down to as short a period as a month, that the late ditches have a chance to take any water; so that the maximum amount of our decrees in this district represents a great amount of water more than we actually use.

The Rocky Ford ditch has a decree of 112 feet, and where at times they use the 112 feet during the dry season when the crops are needing the most water, still possibly one half or two thirds of the season they may not be running over seventy or eighty feet and as low down as forty or fifty feet.

3181 With the older ditches, the Holbrook, with a decree of 155 feet, the Highline with a decree of 418 feet and about 50 feet additional of early water, a part of the time when they are entitled to water are only entitled to a small part of that decree, so that the maximum amount of the decrees represents a very much larger amount of water than is actually used. It wouldn't be a fair test as to the amount of water which is being withdrawn from the river at any given time or for any season to add together the number of feet decreed and the various ditches using the water, as oftentimes the river is so low that the Rocky Ford ditch, with as early a priority as that, can't get its full amount.

Cross-examination.

By Mr. ASHBAUGH:

I have been water commissioner of district No. 17 for nearly seven years, all told. During the last ten years I have been water commissioner for seven years—three years intervening. My
3182 district takes in the Arkansas river from near Fowler to the mouth of the Purgatoire—all lands irrigated by ditches taking their water from the west line of Otero county to the mouth of the Purgatoire, near Las Animas. The Holbrook canal is known also as the Laguna or Lake canal. If you should run a straight line north and south through the town of Rocky Ford, commencing from the south and going north, you would cross the following ditches: The Otero, the Catlin, the Rocky Ford, the Holbrook and the Bob Creek, six in all—four on the south side of the river and two on the north side.

Farther west from a straight line south of Rocky Ford you would come to the Highline, which empties into Dry creek west of a
3183 line directly south of Rocky Ford. If you should run a line north and south across the Arkansas river at Las Animas, or at the eastern line of my district, you would cross one ditch—the Fort Lyon. All of these ditches are in my district with the exception of the Bob Creek, which is in the district above, and the lands of the Bob Creek canal overlap this district, the same as the lands irrigated by the Fort Lyon canal overlap district No. 67.

The seepage, I think, in this district was here before I came, unless it would be a little ravine draining the lands under the Bob Creek canal, and the ravines west of that and along the Holbrook ditch here. The balance of the seepage, to the best of my knowledge, had started before I came. I think this seepage had become
3184 noticeable more than ten years ago. I think as long as you irrigate this land up here the seepage will increase. I think there is a great amount of seepage or underground water that has not as yet found its way to the river. It is lying underneath the line of the canal on the slope to the river, but has not as yet reached the river.

Taking the Rocky Ford Highline canal, which is the farthest

ditch south in going south or southwest from here, the seepage from it goes into the Timpas creek, into Dry creek, into Patterson hollow, the Apishipa, the Chicosa, etc. The lands irrigated by the waters from the Rocky Ford Highline lie south and west from the Otero canal. The seepage water from the Rocky Ford Highline passes down under the Otero canal, unless it is in a draw where it finds its way to the surface and by so doing empties into the Otero, as in a case directly west of here the seepage from the Fort Lyon canal has been intercepted by some underground strata of earth or clay and has been brought to the surface and runs on the surface and will empty into the Otero canal.

3185 The next canal north from the Catlin canal is the Rocky Ford, and this same condition takes place between the Catlin and the Rocky Ford. There is no other canal between Rocky Ford and the river. As to any part of the seepage waters from the farther canal being taken up by the next one toward the river, this occurs only in cases where there is a draw and the water is forced to the surface before it reaches that ditch. It would furnish a greater amount quicker than the ditches lying back, but in time the seepage from the other ditches will find its way to the river and increase that seepage.

3186 As to the question of how far down the river any of the seepage water would reach the river, from an investigation of the underflow to a certain extent under the lands of the Rocky Ford ditch while I was employed by the American Beet Sugar Company, and as near as I could determine, the underflow was from the southwest to the northeast of the country almost invariably, so that on the north side of the river I have not made any investigation of that kind, but judging from the arroyos or the washouts where the seepage water comes out from the ditches on the north, I would judge it to be from the northwest to the southeast. So that the seepage waters from the Highline, Otero, Catlin and Rocky Ford would probably find their way back to the river not farther east than La Junta. That would be my idea. It would be undoubtedly true that all of the seepage waters from all of the ditches in my district lying south of the river would find their way back into the river west of the Purgatoire. On the north side of the river, from the Holbrook ditch, the seepage water would probably find its

3187 way back not farther east than the mouth of Horse creek west of Las Animas. The seepage from the Fort Lyon canal from the fact that it supplies storage water for the Great Plains Storage Company and for those storage reservoirs irrigating lands east and south of the same, would probably find its way back as far east as the State line. I am not as familiar with the Amity canal and the irrigated lands there as those in my own district. I would judge, possibly, that the seepage waters from the Amity canal would find their way back in the neighborhood of twenty miles east of the State line, or until you came to the first natural water shead or arroyo

leading in from the north. The Amity canal does not irrigate any lands in the State of Kansas that I know of.

As to our attempting to prevent waste water, the real reason that is done is to save as much of the water as we can along the line of the stream and to supply as many decrees as possible. We have to save the waste water because the river here ten to ten and one half months of the year is so low that we haven't water sufficient
3188 to supply only the very smallest and first decrees on the river. The months of the year in which we have to exercise the greatest precation in this respect are January, February, March and April, to the 15th of May, and sometimes to the first of June. At other times from the first of June to the first of July, or about the fourth of July, as it is generally remarked here, we have plenty of water for everybody and to waste. It is impossible in many of the years to take it for storage or for direct irrigation. Of course there are little exceptions to those dates. It will run from the 15th to the 30th of May, and from that up to the first of June, and then as a rule about the fourth of July we have to shut down the late ditches on account of shortage. We have intermittent floods, lasting a day or two days, from that on through August. As a rule, though, from the middle or fourth of July on through that month and through August, September, October, November and December we are short of water. We are short of
3189 water for the amount that is really both needed and desired for about ten months of the year. We undoubtedly through those months could use in the neighborhood of six or seven times the amount of water we have. Maybe more than that. Yes, I think we would, probably more than that proportion more, from Pueblo to the State line,—more water than we actually have in the river during those months I have mentioned. Of course there is this proportion that makes it hard to determine that exact amount—the fact that if you had water all the time you might not or would not need so much water, so that it makes it rather hard to come to an exact proportion. During the dry season of the year the amount that we have at the present time is probably not over one sixth or one eighth of the amount that we could profitably use during
3190 those months, figuring on the whole valley from Pueblo to the State line. It is important to have the decree, but it only fixes the limit beyond which they have no legal claim, only during high water. Many times more water is claimed by decrees than our actual amount during the whole season, for ten months of the year. It takes us more time to give attention to the decreed amount of appropriations when there is less water than it does when there is a lot of water. Our hardest season is when there is little water and they are all "scrapping." When they are all "scrapping" we have to be as careful as possible not to give the ones who have a priority more than their amount, so as to be able to give those who have a subsequent right some water at least, and of course our aim is to give all who have a legal claim as much water as we can up a

degree, and of course so far as I know that is the system of other water commissioners.

3191 I report, as water commissioner, to the division engineer at Pueblo. The more water we can prevent ditches from taking, or the less water we can prevent them from taking more than their decree—we certainly turn more down the river. The seepage or return waters that reach the river in my district are subject to being turned into the ditches in district No. 67, if you take it below the point of my district. Of course there is a good deal of seepage that comes into my district up here that I use in ditches here having a prior right to ditches down in the other district, but if it comes in east of the Jones and Riverside or Jones and Town ditch, that is, in Las Animas,—if it comes in east of there then the more seepage water comes in east of there the more passes on down to No. 67.

We had a very good year in 1904. I think we had more than the average amount of water to turn into the ditches this year,

3192 and it is an exceedingly good year for water, especially from June on. In the early part of our season it was very low, but from the time of the starting of the snow and the rain waters from the mountains we have had an exceedingly good season; but even this year there was not enough water to supply all the demands of the ditches all the time. It would be very useful to increase that amount of water. Indeed it would.

Examination By Mr. CAMPBELL:

Rocky Ford cantaloupes and melons originally were raised in this vicinity and took their name from this town—Rocky Ford. My district is about sixty miles long, and there is about 100,000 acres irrigated from the waters of the Arkansas river. I would have to look it up to be exact. This land is worth about $50 an acre. The

3193 months when it is most necessary to have water for irrigation purposes are along in June and July. There is less water in the river in April than in May and June, and I account for it that in April the snow waters have not commenced to come down

3194 and the rainy season has not commenced. Since 1885 the irrigated area has increased. With the same amount of water now we can irrigate more land profitably than we could a few years ago. Water is used more intelligently by farmers and you get better service out of the same amount of water than we did when I first came here. I can't tell you the percentage of increase in the irrigated area. I don't think there is any question but what with a better use and more knowledge and more care we can irrigate a greater amount of land with the same amount of water.

The Fort Lyon ditch, under which there is 55,000 acres of irrigated land, has a decreed appropriation of 761 second-feet.

3195 The Great Plains Storage Company enlarged the Fort Lyon canal for reservoir purposes and as so enlarged have water up to the amount of 933 second-feet, and my understanding is that

the Fort Lyon is to take steps to increase their decree up to that amount. They oftentimes, if not always, during the latter part of May and June use practically the 933 second-feet. They don't have the full amount of their decree during the low season.

Before coming to this district I had about six years' experience in the northern part of the State around Greeley in irrigation
3196 work, making my experience over twenty years. I have made a pretty thorough study of irrigation matters. I think that the use of water by modern methods could be made more economical and that we could get better results. I don't think the farmers are using the water to the best advantage from the methods that we now know of. I think there is too much carelessness. This to some extent is the fault of our laws. Under the present conditions
3197 and the decisions of our courts water is regarded as personal property. Our courts have decided that a ditch can take a decree and do whatever they have a mind to with it. As long as they have a law that is as flexible as that I think there will be
3198 more or less waste of water. This is my interpretation of the decisions of the courts. I can hardly see how it is in the power of the division engineer under the present conditions to utilize the water to any better advantage than it is.

Redirect examination.

By Mr. DAWSON:

The arrangement between the Fort Lyon canal and the Great Plains Storage Company whereby the former, in addition to its 671 decreed cubic feet of water, could take a quantity which would raise the total to 933 feet per second of time, would not be effective as against any prior appropriator or at any time when there was not a surplus of water in the river to furnish this additional amount.
3199 When I speak about the water not being used to the best advantage in this district, it is simply upon the theory that there is room for improvement in practically every line, and this improvement is being gradually made, even in this water district.

Rocky Ford has about 3,000 inhabitants, and it draws its supplies from the agricultural pursuits in the irrigated district of which I have been speaking. There are some fruit lands, but I would hardly call them extensive, although there are a great many orchards throughout the district, I should say one to two thousand acres, and these lands are very valuable on the market. I
3200 don't think there are any of these orchard lands for sale, although I heard that offers of a couple of hundred dollars per acre had been refused. I rather think the orchard lands would bring a bigger price than the other lands spoken of.

Recross-examination.

By Mr. ASHBAUGH:

In "late" irrigation we use the water to as full an extent as we have water to supply it. It is now generally recognized that late irrigation is more profitable than thought for years ago, and this is for an additional reason also—so as to get a chance to irrigate at all, because we haven't the water. For instance, take the Holbrook ditch. In the spring of the year they can't get any water. Right at this particular season of the year it happens to be so that
3201 they can get water; and as for alfalfa, if they didn't irrigate this fall, next spring they couldn't irrigate, on account of the scarcity of the water. The ditches that have the prior rights can irrigate, and the ones that have the later appropriations are compelled to irrigate at other times of the year when it is a physical impossibility to get water. So the method in my district is to furnish water to some of them whenever we can—the prior ones first and the later ones after. If it is possible to give it to the later ones we do it; and this is carried on through the year until it freezes up, and if it doesn't freeze, or in a light winter, we carry the irri-
3202 gation through the winter season. It is a recognized fact that if land can be wetted and it freezes up and thaws out it seems to benefit the land. They don't irrigate so much in the late season of the year under the ditches where they can get water in the spring, for the reason that they can get water then and they take it when they have it.

Redirect examination.

By Mr. DAWSON:

Last year this late irrigation didn't stop at all. This year it is still continuing. But if we get down to zero weather we practically have to stop. December is the month in which we are most apt to have to stop, but the five years I was in previous to this time I think we generally closed about the middle or 10th of December,
3203 and then for a month and a half or two months there would be very little doing, and this winter irrigation refers only to those ditches that have not an early enough priority to get water in the spring.

Recross-examination.

By Mr. ASHBAUGH:

This irrigating "down to the present time" means down to the 16th day of December, 1904, and irrigation doesn't stop along in this neighborhood until zero weather, which sometimes lasts two or three weeks and sometimes only a week.

There are two beet sugar factories in this portion of the State, one at Sugar City and one at Rocky Ford, and they are just starting one

at Lamar, to be completed for next year's crop. As to the amount of money invested in these plants, from general information I would say probably $500,000 to $1,000,000 in each plant, according to its size, making probably a couple of million dollars in all. These beets are grown in the Arkansas valley and could not be grown with-
3205 out irrigation. The Rocky Ford factory is what is called a 1000-ton factory per day and the Sugar City factory is a 500-ton factory and the one at Lamar is about a 500-ton factory.

Examination by Mr. CAMPBELL:

By a thousand tons per day I do not mean for the whole year round. They start about the first or middle of October and may run, if they have a sufficient crop, until about March. Yes, I testified that there were about 10,000 acres of sugar beets raised here this year for the Rocky Ford factory, and I think the yield will run beyond ten tons per acre this year, and this crop will run the factory for 120 to 150 days.

3207 HUMPHREY BEST, Rocky Ford, Colorado.

Direct examination.

By Mr. DAWSON:

I reside at Rocky Ford and have lived in this country close to thirty-five years. At one time I had occasion to observe the Arkansas river in Kansas. That is when I was bringing up a herd of cattle from Texas in 1871, and as I remember, about the middle of July we struck the river near to and a little above Wichita, that is, near the first little town, I don't remember the name of it, and we crossed the river there with the cattle and then followed the
3208 river up about a hundred miles, I think. At first for a day or so it was dry, then we had plenty of water. By that I mean probably a foot or two in depth where we crossed it, and I guess maybe a hundred feet wide. After we got up three or four days' drive it was a pretty difficult matter to water our cattle. We would have to travel along in the bed of the river quite a ways to get sufficient water. We found several places for a day or two where it was dry and we had no water except in pools along where there had been little whirls in the river or low places, and there was no running stream. The water seemed to be in the sand and stood along in pools like. Since that time I have only observed the river in crossing on the railroad. I think it was in October, 1873, I came out as far as Granada. I unloaded a car of stock there. I was right on the bank of the river at that time, and there was little or no water running there then. We had to come from there up here by land.

3209 I have noticed the effect that the irrigation of land in and about Rocky Ford has had upon the former dry arroyos in

this country. I notice that a great many arroyos are running water now that didn't use to, that were perfectly dry at one time, and I have also noticed the effect that irrigation has had upon the water level under the country here at Rocky Ford. I think in probably 1876 they dug a well up here near where the Rocky Ford hotel is. However, it was about the time the railroads came through here. It might have been as late as 1877. They went down forty feet deep in that well and didn't strike any water except a little in the shale, and now you could get water within ten feet anywhere.

3210 At seven or eight feet you will strike water, but you can get a very good well at eight to ten feet right here in town. The Smoky Hill river in 1871 had plenty of water in it for stock. It was not running only just in places. We struck a place where it would run for one or two hundred yards and then it would be

3211 dry for a ways, and as I remember, the Smoky Hill river was that year in the same condition as the Arkansas. I think I have noticed the seepage water in the dry arroyos coming from the irrigation for about ten years since I have taken notice of it myself, probably fifteen years on the south side.

3212 OLIVER B. STAUFFER, Rocky Ford, Colorado.

Direct examination.

By Mr. HAYT:

I am about fifty-four years of age and reside at Rocky Ford. I am running a meat market at present and have lived in Colorado ten years and in Rocky Ford about four years. At one time I lived

3213 in Kansas, in Rice county, six miles west of Sterling. I settled in Kansas in 1879 and lived there a little over thirteen years. When I was living in Kansas I had a little claim there, farming, about two miles from the Arkansas river. We could see into the river sometimes in the spring time, and when the river was up, from our place. I was down to the river frequently in 1879, just as anybody would living along it. When I was first in Kansas my family wasn't with me and I stayed with other parties and was nearer the river than my claim was, being within only half a mile from it, and could see it very plainly—as plainly as you could look out into the street. This was in March, and I saw the river fre-

3214 quently during the spring and summer months that year, and I crossed it quite often. The first time I crossed it was during the month of February, 1879. I was up and down the river looking for a location before I concluded to stay at this point, and I crossed it in February with a land agent and another gentleman from Iowa, each of us crossing the river on horseback, and it was about knee deep at that time to the horse, from bank to bank. The place we crossed it is known now as Raymond, Kansas,

and I think the river was about eight hundred feet wide, and
3215 knee deep to the horses would be the deepest place. In July of that year there was no running water there at all; there was only water in the depressions. A couple of boys about fourteen years old came up from the river and stopped at one of those water holes and fished out quite a long fish and came up with that and were excited. so us fellows around there, we weren't doing much, we went down the river to fish, and we followed up these water holes, I guess a mile or more up and down the river, to fish. There was no water in the bed of the river outside of these water holes, and as near as I recollect, it continued more or less dry up until in October; then we had some pretty heavy rains and there was more
3216 water in the river. In 1880 I saw the river quite frequently, and I remember after moving upon my claim I crossed the river with two neighbors by the name of Eyman and Fair to go to some lakes, fishing. It was very dry and windy, and we drove around by the way of Raymond, over the bridge, but there was no water in the river. After we had been over there two days we came home, and as we knew there was no water in the river we concluded to cut off four or five miles and drove angling to the northeast. We struck the river below Raymond, probably two miles, and drove down the bed of the river for possibly three miles, until we struck the line running east and west on which we lived, and it was very windy. There was no running water in the river at all. I
3217 didn't even see any water holes on that trip. I think a time or two in June and possibly a few days in September or October we got word that the water was coming down the river,
3218 but I didn't see it until after it had come. I know anyhow that we had water in the river after this, somewhere about the first of October. In this description of the river I am referring more particularly to the years 1879 and 1880. I saw the river dry at other times, between 1880 and 1893—I think as many as four or five times at least. There may have been some water holes. It was probably not entirely dry, so much so as it was in 1880. No, there were times there was no running water. I was back there and spent a couple of months this last winter, in the months of Febru-
3219 ary and March, 1904, and the country was very much improved and looks a great deal more homelike. It looks pretty prosperous now, while in the early days it was pretty hard to make a living there.

Cross-examination.

By Mr. ASHBAUGH:

It was in 1880 that I spoke about fish being in pools. I suppose they got there at the time the water was up a little more than it was at that time, and I suppose they came up the river. The
3220 time when the high water came down the river that I spoke of, in 1880, was some time in June, as I recollect. It came

down the bed of the stream. I have no recollection of any rain storm at that time. I do recollect that we had a heavy rain storm on the 18th day of May at this time. It was knee deep over the prairie and the creeks were all up at that time. I don't recollect so much as to whether the river got high immediately
3221 after that or not. It was sometimes talked of among the farmers about the water coming down the river, and we would hear it just as we would hear anything else. There was no danger of water in the Arkansas injuring anybody. When I spoke about cattle drowning out on the prairies, it was just what several somebodies told me. I didn't see the dead calves.

3224 I had some wells on my farm, and I got water in one at eight feet and in another at eleven feet. They were driven in 1880. They were about two miles back from the river. The land back at Alden is pretty nearly level. My land was on the south side of Cow creek, which runs southeast all the way through Rice county. Sometimes there is a great deal of water in Cow creek and sometimes there is none. I wouldn't like to say that I ever saw Cow creek actually dry. I crossed it once when I think there was about four inches of water in it. As to the Arkansas river during the thirteen years I lived there, sometimes there was quite a bit of water and at other times not very much. By "quite a bit" I mean two-thirds full—two-thirds of the way across the bed. The bed is pretty wide. At other times I have seen it when it was dan-
3226 gerous to cross. When it was dangerous to cross it runs very swiftly, and there is quicksand in the bed of the river, making it treacherous. I believe in the winter and spring of 1884 the river was almost bank full for months. I might be mistaken as to the year; and it was covered with ice from bank to bank. We crossed the river on the ice, and when it broke up it roared and tore terribly, but didn't get outside of the banks. I never saw the river overflow its banks, not even a quarter of a mile out, except possibly in some low depression that has at some time been a part of the bed. This high water may have continued away up into the summer, and maybe it didn't. It was generally supposed that in June the water would be up more than any other month during the year; that is, by the people who had been there longer than I had. That didn't seem to hold out so well, quite, after I came there, yet sometimes it did come up in June more than any other months. There were months along, and short periods, that there would be more water than at others. I have seen the river tremendously high in August. I think that was in 1886, but it didn't last very long. Perhaps not longer than two or three weeks. In 1886 Cow creek was as
3228 big or bigger than the river. During the periods of high water we never noticed any difference in the wells at all. I can say this, in speaking about the rise of water, that when it came, if it had been dry for quite a little period and it was going to rain, our iron pumps would all get wet—gather water on the outside—

and the water would always be ready to pump out the first stroke. We didn't try to measure the water in these driven wells.

Redirect examination.

By Mr. HAYT:

3229 When I spoke of the river being the width of this room I meant about fifteen feet. The Crow creek I am speaking of emptied into the river about twenty-five miles below where I lived. The Walnut entered into the Arkansas river east of Great Bend about three miles, I think, and the Pawnee was up farther, I don't know just how far. On the south side was Salt creek. That emptied into the river just below my place, straight opposite. Salt creek came up the same as other streams when there were heavy rains.

Recross-examination.

By Mr. ASHBAUGH:

3230 There was water flowing in Salt creek only at times. It is a surface stream, or principally so. I could hardly say that it flowed the year around.

3231 W. N. RANDALL, Rocky Ford, Colorado.

Direct examinatiom.

By Mr. HAYT:

I have lived at and in the vicinity of Rocky Ford for sixteen years, and am a civil engineer. I was engineer in charge of the building of what they call the Oxford Farmers' ditch and the Lake or Holbrook canal and some smaller ditches.

I first became acquainted with the Arkansas river between Pueblo and Rocky Ford in the fall of 1887.

The area of land under irrigation in this vicinity has increased materially since I came here, and I have noticed that these small, dry ravines that were dry when I first came to the country
3232 are now running water constantly. You take the Chicosa stream that, when I was engineer for the Oxford Farmers' ditch in the winter of 1888 and we built a flume across that Chicosa creek on the Oxford Farmers' ditch, that is, about half a mile long, the ground was so hard the entire width of the stream that they could hardly drive piling for the flume, and now there is water running down the Chocosa at all times I have passed it. Since that time the Highline ditch has been constructed south and most of this seepage water is from the Highline ditch. All of the lands irrigated from the Arkansas river in this vicinity drain back into the river. I am of the opinion that the effect of the irrigation of the lands in this vicinity is to cause more water to run in the river dur-

ing the dry period than there would be if the ditches had not been constructed. From the middle of May to the first of June we
3233 run large volumes of water out onto the lands. That is the time that the river furnishes its largest flow. The water is used on the land for irrigation and soaks up the ground, and you can take all of the deep marked ravines during that period and the remaining part of the year—they are all running water into the river. And you take it along the bluff where there is this black shale along the river, there is water running on top of that shale and coming into the river that you can observe, and I am of the opinion that where you don't see it coming in over the top of the shale it is coming in underground. In my opinion there is not far from one hundred thousand acres of land irrigated from the Arkansas river between Pueblo and La Junta, leaving out that large canal that Mr. Cressy (a previous witness) spoke of, lying east of here, and these lands are used for the production of the various crops that can be grown in this latitude and which could not be grown without irrigation. These lands would have no value for agricultural purposes without irrigation, as they would only be of small value for grazing. Grazing lands in this arid country are worth from $1 to $1.25 per acre, I think, and the lands under irrigation—that is, under the larger canals—with later decrees would run from fifty to seventy-five dollars an acre, and the lands near the railroad and under the Rocky Ford and Catlin canals are worth anywhere from one hundred to three hundred dollars an acre, not counting the fruit crops on them, and I would think the average value of all these irrigated lands would be from fifty to seventy-five dollars an acre, as the larger amount under the larger canals would be fifty dollars and acre.

Cross-examination.

By Mr. ASHBAUGH:

3234 The one hundred thousand acres I spoke of are the lands already irrigated. The seepage that I spoke of returns to the river at different points along it. Taking the ditches west from here, they increase the river between the heads of the canals and a certain distance below the end. This would increase the flow of water below La Junta if it was not taken out. The seepage from these ditches above would not flow into the river from the south side below La Junta. There are creeks at La Junta that would stop it from going by. The seepage from the canals on the north
3236 side will reach the river all the way from the head of the Bob Creek canal to something below the Kansas line. I said the Kansas line because I don't know just the terminus of the Amity canal. And this seepage would not go around the Amity canal north. If the Amity canal should empty into a creek at the end, I think there would be the terminus of that water. This seepage from these canals going into the river tends to supply the ditches below with a greater amount of water than they would get if the

seepage had not been added to the average flow, if those ditches took
it out. The Amity canal has the capacity to take a large de-
3237 creed appropriation, and is doing a large business—the largest
of any of the lower ditches. The seepage that returns from all the ditches above Rocky Ford could all be used by the Amity canal if it could get it, but they have not found out a way yet to stop this seepage and get it into the ditches. The seepage from the Amity canal can likewise be taken out by the canals below that. The Buffalo canal right down near the State line is the last one with a late appropriation, and it can take all the seepage that reaches it. So that, as to whether this seepage increases the flow of the river in
and through the State of Kansas, it would have to depend
3238 upon the question as to whether the ditches took up this *spee*age water. I didn't say it increased the flow in the State of Kansas. I don't know whether it does or not. I haven't been down there. All the water from seepage that could possibly affect the flow of the Arkansas river in the State of Kansas would be the
amount that returns to the river below the point where any
3239 ditch could take it, outside of what would pass under the
sands and down. All this seepage returning to the river simply supplies ditches lower down the river with subsequent appropriations, if they take it out. I think the ditches with
3240 early appropriations get most of the seepage water. It would
increase the amount of water in the river below where the ditches are taken out. Whether some of that reaches Kansas or all of it or is taken by the ditches down below I am not able to tell. (Objection.)

Redirect examination.

By Mr. DAWSON:

3240 There would have to be an end of this returning seepage somewhere, but I think there would be some that would come in anyway, for the Kansas ditches even, but just how much, as I have not observed the river at the Kansas line or that part of it, I cannot say.

3241 GEORGE W. SWINK, Rocky Ford, Colorado.

Direct examination.

By Mr. HAYT:

I have resided in Colorado since 1871, and am sixty-eight years of age. My occupation is farming. I have been county commissioner
of our county and mayor of Rocky Ford at times. I have been
3242 in the State senate two terms, for a total of eight years. I was
superintendent of the horticultural department and prairie department at the St. Louis Exposition in 1904. I first engaged in the

mercantile business. In 1874 I began a little garden spot on what we might call, the low lands near old Rocky Ford. Old Rocky Ford is situated about three and a half miles northwest of Rocky Ford and was known in the early times as Rocky Ford. At
3243 first I engaged in agriculture in a small way here. We dipped the water out of a well and filled up some barrels and let it stand a day until it was warm and irrigated the garden. We did this because it was too cold to use without being warmed during the day. In 1875 we succeeded in getting out what was known as the Rocky Ford ditch. We built it down a little past my location, and I put out forty acres of an experimental crop of wheat, oats, corn, cantaloupes and watermelons and pretty nearly all
3244 kinds of stuff. We made the experiment to ascertain what would grow best in this locality. I put out what I called an experiment garden, because it was the general impression that we couldn't grow anything here, and so many said this that I became doubtful myself, but from the experiment I made I made up my mind we could grow pretty nearly everything. I was raised in Illinois, and by experience knew that was a great corn country,
3245 and from my growth of corn here I didn't take much stock in it as a corn country. But all kinds of fine crops, such as pumpkins, squashes, watermelons, etc. grew much better than I had ever seen them grow in Illinois. Spring wheat didn't do as well as in Illinois. I afterwards commenced farming down where the beet sugar factory now is. A little later I put out cantaloupes on the market, and watermelons, and shipped them nearly all over
3246 the State. We also shipped them to Topeka, Kansas City, St. Louis, Chicago, and nearly all over the East, and the demand increased the acreage, especially of the cantaloupes. The special variety of Rocky Ford cantaloupes that is known all over the country was developed in this wise: The first cataloupes
3247 I marketed were of the variety called the Jenny Lind. I finally found a variety that seemed to me all right, and I took the seed out and planted them, and by making selections I improved the quality and color and flavor and finally developed the Rocky Ford cantaloupes.

3248 (Page- 3248 and 3249 contain a more minute description of cantaloupes.)

3249 It has been my experience that cantaloupes properly belong to an arid climate more than to a rainfall or excessive rainfall climate. It requires just about a certain amount of moisture to grow them and sunshine to put the sweetness into the
3250 cantaloupe. The cantaloupe industy has developed in this locality until the demand today is almost unlimited for first
3251 class quality goods such as we produce. I think we have shipped eight hundred cars or over each season.

(On page 3251 is a discussion of some early difficulties in producing cantaloupes.)

I found by the use of bees that they would serve to carry the pollen and that the cantaloupes were better developed by that
3252 means.

The St. Louis exposition developed the superiority of the Colorado honey over others, especially in regard to its color
3253 and weight. Alfalfa has been found to be a great stimulus to the production of honey. This crop grows especially in
2354 the arid region under irrigation. So also does the sugar beet where it receives copious sun light and heat.

(Page 3255 relates to the comparative qualities of cane sugar and beet sugar. Page 3256 relates to the witness' experience in encouraging the growth of the sugar beet about Rocky Ford and some efforts made by him in the legislature to stimulate this industry. Page 3257 relates to the witness' efforts to build up the sugar beet industry in and about Rocky Ford; also page 3258. Pages 3259 and 3260 relate to the results obtained in and about Rocky Ford in the growth of sugar beets, showing its superiority over other parts of the United States in the production of that crop.)

3261 In 1894 Mr. Henry T. Oxnard (of New York) came right out and made an investigation and followed it right up with the building of a beet sugar factory. The factory has been in operation about five years. The beets used at the factory are
3262 all grown upon irrigated lands and as a result of irrigation. They could not be grown in ordinary seasons without irrigation.

Cantaloupe seed cannot be saved for less than seventy-five cents per pound.

3263 I am interested in five canals along the Arkansas river in Colorado and one in the State of Kansas. The latter is called the Great Eastern canal. I am one of its officers—director and president. It is named the Arkansas Valley Beet Sugar Land and Irrigation Company. The ditches in Colorado in which I am interested are called the Rocky Ford; the Catlin Consolidated canal; the Rocky Ford Highline canal; the Bob Creek canal; the Excelsior canal; and those are all that I am in.

3264 Commencing with the canal farthest up the river of those I have mentioned, namely, the Excelsior canal, I think it has a capacity of sixty cubic feet of water per second of time. Its headgate is above Chico, about forty miles from Rocky Ford. It was constructed about 1860 and irrigated lands on the north side of the Arkansas river from Chico down about six or seven miles. The width of the canal at the head is twenty feet, and it tapers as it continues down. It is about twenty feet in width now. It is a
3265 short ditch, about seven miles in length. I don't recollect just the number of acres irrigated by it. I have been interested in that but a short time.

3266 The next one as we come down the stream is called the Rocky Ford Highline, with a carrying capacity of about five

hundred cubic feet per second of time. The head-gate is just below the head of the Huerfano on the south side of the river, in Pueblo county, about thirty-two or thirty-three miles from Rocky Ford. It is about thirty-two feet wide at the head. I don't know the grade, but it is a little over one and a half feet to the mile, I believe. It is about five feet in depth. It runs south of the town of Rocky Ford. The nearest point is about two miles south of Rocky Ford. It irrigates about twenty-seven thousand acres tributary to Fowler, Manzanola and Rocky Ford.

3267 The next ditch is the Catlin Consolidated. It comes out at the mouth of the Apishipa, about twelve miles west of here (meaning Rocky Ford). It is twenty feet wide on the bottom and carries four feet in depth. It must be about forty miles, on the ditch line, in length, and irrigates about thirty thousand acres. These lands are located opposite Manzanola, Rocky Ford, and southeast of Rocky Ford, and near to La Junta. These lands are chiefly tributary to Rocky Ford.

The next ditch on the south side of the river is the Rocky Ford, the first ditch that was built in the valley here. We commenced constructing this ditch in 1872 or 1873. It has been enlarged

3268 since that time a little. This ditch is twenty feet on the bottom, carrying five feet of water, and is about eighteen miles long. It irrigates twelve or thirteen thousand acres of land. These lands are tributary to Rocky Ford. I am interested on the Bob Creek ditch that goes under the name of the Colorado canal. It comes out above the Huerfano river in Pueblo county, about forty miles above Rocky Ford. It is forty feet on the bottom, at the head, about six feet in depth, with a grade of a foot to the mile, and the length is sixteen miles. It was constructed in 1884. I don't know the number of acres irrigated by this ditch.

3269 These are all the ditches in Colorado that I can think of in which I have an interest. The cost of construction of the Bob Creek ditch is $500,000; of the Highline $200,000; of the Catlin $100,000, and of the Rocky Ford $8,000, but it has been enlarged since. I don't know the cost of the Excelsior ditch, because I never had anything to do with it until recently.

I am acquainted with the value of irrigated lands in this

3270 part of Colorado. I think that $80 is about the average value. It varies from $25 to $250 an acre, owing to what ditch it is under, how close to town, the management, prior right to water, and all such as that. Eighty dollars I think would be about an average, taking the whole thing together. Well, the value of lands that have water at all times you couldn't put less than a hundred dollars an acre on an average. Without a water right they would be worth very little, not more than the Government price of

3271 $1.25 per acre. Without irrigation all of our industries would be ruined and the country would go back to its original condition and it would only be a stock country.

The traffic on the Atchison, Topeka and Santa Fe railroad through

this county is derived from the improvement of the country under irrigation, with the exception of stock interests.

There are lots of people making a living on ten acres here, and I think a man can maintain a family of five decently on
3272 five or ten acres. The productiveness of the land varies greatly. Sometimes it has yielded as much as $300 an acre. This is for small tracts of five or ten acres each. As to the ownership of the water and land, I will say that the ditches now only sell perpetual water rights and that the water right is described in the deed along with the land it goes with and is considered an appurtenance to the land. We used to sell some water by the acre, but I don't know of any sold in that way. They now buy so much stock in a ditch and that represents their proportion of the water, and when there is water in the ditch they each get
3273 their proportion of it. We found it unsatisfactory to separate the land from the water in making sales. All the ditches I have mentioned derive their water from the Arkansas river. These ditches depend most altogether on what we call flood waters; that is, waters that come in quantities from the side streams into the river and then into the ditches. I would consider that ninety per cent. of our irrigation comes from the freshets or high waters of the different streams that empty into the Arkansas. The high water begins when the rain commences on the foot hills and on the plains. The first land I settled was a timber culture, and then a
3274 preëmption. I think I took them on the same day. Then I took up a homestead after I had proven up on the preëmption. About two years ago I took up a desert claim. The timber culture is on section 7, 23 south, 56 west. The filing number is 3, and the patent number is 1. We broke the land up and put
3275 it in cultivation. In the first year I put out cottonwood slips. In the end we had about eleven hundred acres in timber. I used irrigation to grow the trees. They wouldn't grow without it. The dersert entry is in what is known as Patterson hollow, about nine miles from here. I am endeavoring to get the water there and am arranging for the building of a reservoir and expect to
3276 get the waters from the Apishipa. In 1871, 1872 and 1873 I was quite familiar with the river from Rocky Ford to Las Animas. It was called then West Las Animas. And then from 1875 up to the present time I have been pretty familiar with it down as far as the State line, in fact clear down the line on the Santa Fe road. About Las Animas during those years there has always been more or less water in the river. Sometimes it would be low, but I never saw the river dry at Las Animas, but have seen it frequently dry below the State line, more especially along about Coolidge. I was there very frequently in the early days, because we freighted down there. We hauled goods from down there. I was run-
3277 ning a general merchandise store then. I have seen it dry when there wouldn't be any water for a long ways. This would occur in what we call the extremely low water season of the

year. Generally the low water would come in the fore part of the season, and then after the flood waters had all passed and gone. The first year I saw it dry about Coolidge that I recall was in 1875. Between 1875 and 1880 I was down there quite often. I have been in that country a good deal of late years. The comparative flow of the water in late years with those between 1875 and 1880, especially the last three years, I have noticed more water in the river below Coolidge than there was before; that is, in the early days, in extreme low water. I think the flow of the water now is more uniform.

3278 I mean Coolidge in Kansas, a little east of the State line. I was with Professor Newell, of the Government survey for three weeks measuring the river and the different ditches along the river. I remember a little experience that illustrates the condition in western Kansas. We had been stopped from measuring the ditches by a large flood in the vicinity of Pueblo, and it put the Arkansas river higher than it had been for years and stopped our work, and then Mr. Newell came back later on, some time toward the fall. He said when the river went down a little from the flood he wanted to measure it at the State line. We went to Coolidge and went out to the bridge across the river there to measure the water there and there was no water at all in the river. It was two and a half feet, about, from the sand to the water that stood in a barrel where they dipped water out of the river. The barrel

3279 was sunk in the bed of the sand. It was maybe two and a half feet to the water in the river. It tapped what we call the undercurrent. A little incident occurred in reference to the use of rubber boots by the professor. He got on his rubber wading boots and asked me if I didn't want to do the same, and I told him no. We started down to the river and he got about half way across before he dropped onto it being a river. He says "Isn't this the bed of the river?" I says "I think it is." "Well," he says, "I thought it was, but I know it now." He got a little irritated over it. He said he didn't care particularly about finding the river dry, if I hadn't let him go in with his waders before I knew there was water in the river. I think that was about 1885. It was about the time we built our large ditches. It was before there was any con-

3280 siderable irrigation from those ditches. In reference to irrigation in western Kansas, I will say that my experience is pretty limited. I had owned a ditch down there for about two years, but we have been spending most of the time cleaning it out and getting it in repair. We did a little irrigating the year before last. Last year we had plenty of water and irrigated all the land we wanted to. This ditch is called the Great Eastern. The head-gate of the Great Eastern is about opposite Hartland, Kansas, about thirty-eight to forty miles east of the State line. It is thirty feet wide on the bottom at the head-gate, for a mile and a half down. It tapers from the head. Its slope on the sides is one-to-one, and it narrows down to twenty feet in width on the bottom. It carries its size well for fifteen to eighteen miles until it gets below Deer-

field, where it turns north. The total length of the ditch is about sixty miles, and it carries three feet of water in depth at the
3281 intake and five feet where it narrows down to twenty feet. It has an appropriation of 292,000 statutory inches, or, it is worded more this way—"292,000 cubic inches of water under a five-inch pressure," which I believe means a statutory inch. It runs parallel with the river for about three miles and then turns more north. The bluffs come down middling close to the river for about three miles, and at that point it turns in a northeasterly direction, and when it gets down to Deerfield it turns more north. After it gets on top of the hill
3282 it runs more north. The most remote point of the ditch from the river is six miles. It is built on a ridge to irrigate lands to the north that drain away from the river. After you get up on the rise the whole country slopes north back to what is called the White Woman. The latter is the name of a river that is tributary to the Arkansas. The ditch would irrigate 40,000 acres of land. It has a greater fall that most ditches. The average is three and a half feet to the mile for the first twenty-five miles. It is tribu-
3283 tary to Lakin, Garden City and Deerfield, Kansas. I became interested in this ditch because I could see a pretty bright future for the country down there. Land was cheap, and for the last few years water was a little more plentiful, and I began to think more of that country in general, and that particular enterprise was brought to my notice by Ed Wirt, of Garden City. I regarded that in low water we have more water down there than we used to have, and it is going to increase from what it is to-day, and that the country is a little different from our country up here. I don't think it takes as much water to irrigate as the land does up here,
3284 and they have more moisture in the fore part of the season than we have up here, and that would enable us to carry it over until the rise of the river, and then we will have plenty of water to irrigate. I consider the rainfall greater in western Kansas than in eastern Colorado. I think we have about the dryest spot that anybody has; but it has not been for the last two or three years.

I have given some attention to return waters, and the effect of seepage water from irrigated lands. A little ways below Pueblo on the south side of the river where they irrigate in what is called the Bessemer country there is an arroya there that runs quite an amount of water that used to run none at all. In the early days it was dry all of the year except at flood time. And then the next place I am acquainted with—and it is very notable—is near Fowler
3285 where they took out the Oxford Farmers' ditch and irrigate the lands above; and then what is called the Fosdick ditch just below the bluffs. That would run after the Farmers' ditch would run a little while. But that ditch was running quite a lot in it and all the water came from the seepage from the higher grounds and from the ditch.

Then you come on down to the Apishipa where the Highline and

the Oxford Farmers' ditches water some of the lands. The Apishipa becomes a running stream all the time, that did use to run before these ditches were built.

Then you come on down here to Timpas creek; that creek runs quite a little water and it didn't use to run at all only in high water. I have noticed some on the south side down in the vicinity of Las Animas, little arroyas that run water all the time that didn't use to run at all. In fact wherever they irrigate any great length of time I think all the little arroyos have water in them. Now, Crooked arroya down this side of La Junta runs water all the time and used to be dry all the time excepting flood times.

3286 As to the Arkansas below here, I am not so familiar with the conditions, but I have been told that there have been some filings made on seepage water down there. We rely upon water for the Great Eastern ditch in Kansas particularly upon the flood waters of the rivers. For the last two years there was no time but what we could have drawn from the river quite a little water, but not enough to irrigate any great amount. Probably at the lowest time five or six feet would be drawn there. I figure that will increase as the country is more irrigated above there; that there will be still more of a continuous return to the river that will help it out, and then when high water comes we will have a good supply. During the last two years we have always at the lowest stage of the river had some water in that ditch for irrigation; at other times there has been plenty of water. When what we call the rises in the river come we would have plenty of water.

3287 As to the tributaries of the Arkansas river between Rocky Ford and the intake of the Great Eastern, the first below here is the Timpas creek; the next is Horse creek on the north side; then comes the "Picket Wire" or Purgatoire, then the Big Sandy on the north side; then the Adobe creek on the south side; then there is a creek near Lamar that I don't recall the name of. It is quite a creek and runs lots of water sometimes. Then there are numerous other small creeks that I don't know the names of. There are some ditches middling close to the State line and some of them carry water over into Kansas. The Purgatoire runs an im-

3288 mense amount of water at times. At times it is uncontrolable. There are no ditches between the mouth of the Purgatoire and the State line to take this surplus water during high flood times from the Purgatoire. The people in western Kansas rely on irrigation for the raising of crops. If water were prevented from being used from the river in eastern Colorado or western Kansas it would in my judgment be a great injury to the people in both places. (Objection.) If the average flow of the Arkansas river at Cañon City is eight hundred cubic feet of water per second of time, I don't think it would ever reach western Kansas if not used for irrigation in Colorado. The water that I have mentioned as belonging to the Great Eastern is a decreed water right. The decree

was entered in the United States court or in one of the higher courts.

Cross-examination.

By Mr. ASHBAUGH:

The eastern end of the Bessemer ditch to which water is conveyed is in ranges 62 and 63 west. The eastern end of the Excelsior ditch to which water is carried for irrigation is in range 64 west; of
3290 the Catlin ditch it is in 55 west; of the Rocky Ford Highline it is in 57 west; of the Rocky Ford ditch it is in 56 west; of the Otero ditch in 55 west; of the Bob Creek or the Colorado canal 56 west; of the Laguna or Holbrook 54 west; of the Fort Lyon canal 45 west; and the most eastern point to which water is carried for irrigation in the Amity canal is in range 45 west. As to the Amity canal, I don't know that water is actually carried that far. The most eastern point to which water is carried for irrigation in the Lamar canal is about the west line of range 43, and of the Buffalo ditch it is about the middle of range 44 west.

I don't wish to be understood in my direct examination to say that there are no ditches in Colorado whose intake is east of the Purgatoire river, because there are such ditches. There is a ditch that comes out of the Muddy, and there is also the Colorado-
3291 and-Kansas, and on the north side the Amity, and the Lamar is below the Purgatoire, and also the Buffalo Creek ditch. The seepage from all of the ditches in Colorado west of the Purgatoire river would flow into the river so as to be taken up by the Amity and the Lamar and the other ditches located east of the Purgatoire river.

I spoke about taking water at flood season. We don't take it at other times in the year because we can't get it, because there isn't enough to supply the older rights and we are not allowed to take it out. We are only allowed to take water as the superintendent directs us. He has not nearly enough water in the average or normal flow of the river to supply all the appropriations.

I am not positive, but I think the Great Eastern ditch in Kansas was dug in 1882. It is my understanding it was operated more at intervals. Sometimes it was in order to carry water and at
3292 other times it was not in order to carry water. Most always when the river was high they carried some water in it. When the river was low they didn't carry any water in it because they couldn't get it into its head. I don't know whether there was any water in the river to get into the Great Eastern ditch at low times except during the last two years. There was no great amount of water in the river in 1903 so as to supply the Great Eastern ditch or any other ditch in Kansas at low water. I don't know whether the river was absolutely dry through Hamilton county, Kearney and Finney counties in Kansas, from August, 1903, to the first of May,

1904, but I think that was the case. I never saw the river dry
3293 in western Kansas during the winter time. There was a good deal of water flowing in the river since the floods of May, 1904, and 1904 was one of the best years.

I do not recognize Complainant's Exhibit A–45., I don't think I was ever at *at* the Garden City bridge. But there is quite a difference between the water in the river in the winter time and
3294 in April—there might be. In speaking of the land in Finney, Kearney and Hamilton counties, Kansas, being cheap, it is good land in the bottoms. It is cheap because they haven't had water to irrigate it. They haven't had the ditches in order. I haven't seen many of them in order. They were out of water because they filled up with mud and were neglected. That would be the natural reason. I think these ditches in western Kansas were dug about the years 1880, 1881 and 1882. I know of the ditches there—of the Collier ditch, the Amazon, the Garden City,
3295 the Great Eastern and the Western. The Garden City ditch I think was bought up and rebuilt by the farmers around Garden City because it had been abandoned. I think it was abandoned because it didn't pay or the country was neglected or something of that kind, and I understand that the companies that owned those ditches went bankrupt. I don't know why they went bankrupt unless it was bad management or something of that kind. I don't think it was because there was no water for the ditches, because there was water there part of the time at any rate. I never saw the time during the summer time that they didn't have plenty of water coming down that river—in time of high or flood waters I mean. I don't know how many years they irrigated and I couldn't tell about whether they were prosperous and profitable because I never had anything to do with that country at that time. The ditch we bought, the Great Eastern, looks like it had been practically idle for the last ten or twelve years, but I don't know that it was practically idle and the company be-
3296 came bankrupt because of loss of water. I found the land down there both of good quality and cheap around Garden City, Lakin and Hartland and in that vicinity. They tell me around Garden City that land has gone up over fifty per cent. in the last two years. The reason is because the ditch has been put in order and when there is water in the river they can get it. I think they have been encouraged as to their irrigation ever since the ditch was put in order. I don't know very much about the condition of that ditch from 1890 to 1904. It might be true that if water had been plenty the ditch could have been very much superior to what it was. It makes a whole lot of difference about the management of the ditch, whether there is water or no water in the ditch to supply it. If you don't have any water and are never going to get any water of course there is no use to have management; but if you have your ditch in order when the water comes

generally the people get the right amount of water. If there
3798 was water in that ditch three months in a year and at the right time of the year, that is all those people want down there from Coolidge to Garden City, and that is all they ask. There has been water this year down there for three months in the year, but I don't know as to the other years during the last thirteen years prior to 1904.

These ditches near Rocky Ford, especially the larger ones, were dug from 1884 down to about 1891.

As to the seepage that can be taken up by these ditches below the place where it gets back into the river and yet not exhaust either their appropriations or their needs, it can all be taken by these ditches, that is, in time of low water. In time of flood waters they can't do it at all. In order to increase the flow of the river in Kansas by the seepage water in Colorado it must reach the river below the intake of the ditch farthest down in Colorado if the rights of the ditches would take it all from above that point. There are
3299 two ditches whose capacity and whose appropriations have never yet been supplied with water in the eastern part of Colorado in low times. I refer especially to the Lamar and the Amity canals. The Amity is one of the largest and best constructed ditches in Colorado. The Lamar ditch has just now received a new impetus by the location of a beet sugar factory at Lamar.

In speaking of the appropriation of the Great Eastern ditch, I gave it in inches. I don't know as I could give it in cubic feet per second of time, but approximately, as I understand, it takes about sixty cubic inches to make a cubic foot of water. That is, of the statutory inches, to make a cubic foot of water.

Examination by Mr. CAMPBELL:

3300 We have the most water in the river in the months of June, July and August.

3301 I never knew of any practice that permitted a man to own water that he never had applied to the land. We don't
3302 recognize the practice of getting an appropriation of water and loaning or selling it to some person below who has not a prior appropriation. Our acreage here under irrigation is increasing year after year from the same amount of water. There are two reasons for this—one is that as you irrigate land it takes less water. It depends somewhat upon other circumstances, such as the
3303 formation of the soil, etc. If it is sandy it takes more. If it is adobe soil it don't take water so freely and takes a little less. We use it very economically. We don't allow the waste of water like we used to. We have improved a good deal within the last two years and are improving all the time in the use of water in applying it to the land with more economy.

I am pretty familiar with the Arkansas valley from Cañon
3304 City away down into Kansas. I know very little of it above Cañon City. I have been clear up to the head of the river. I

understand there are a good many reservoir sites along the Arkansas river, but have never investigated it. In the Great Eastern ditch there is one little place that would make a very nice little reservoir, and on down towards—well, just beyond the lower end of the ditch there is a very nice little reservoir site there, and that is as far as I know about the reservoir sites in Kansas. I couldn't tell you as to the amount of water that escapes here in flood seasons and that is not applied to irrigation purposes. It is a whole lot sometimes and at other times not so much. If these flood waters which escape could be impounded in reservoirs they would reclaim a whole lot of land.

3305 Redirect examination.

By Mr. HAYT:

In reference to waste water in Colorado, I will say that it is guarded against in this State a good deal now. There has been bad management of ditches in Colorado as well as in Kansas. I have never known of ditches being abandoned in Colorado because of bad management, but the farmers got but little water out of them
3306 owing to the bad management. I have known a time when the Lamar ditch was not considered a profitable enterprise. I think it is better now. The Otero ditch has been one of the unfortunate ones in management, but it has improved. It is one of the most important things in the improvement of our country to keep the ditches in the very best order all the time. It is the most important thing we have.

Recross-examination.

By Mr. ASHBAUGH:

In order to have a ditch profitable it is of course important to have water for it. A ditch without any water is the poorest property a man ever did have.

3307 H. W. POTTER, Rocky Ford, Colorado.

Direct examination.

By Mr. HAYT:

I reside near Rocky Ford, Colorado; age 45; business farming and cattle raising. I have been acquainted with the Arkansas valley about twenty-five to thirty years. I was upon the Arkansas river in western Kansas in 1879, about the 15th of May until the first of June. We were rounding up cattle. I struck the river at Lakin or a little below and we worked up the river to Las Animas. The distance is in the neighborhood of a hundred miles.
3308 Lakin is in Kansas. The condition of the river at Lakin was dry, with the exception of water standing in the holes where

it had washed out deeper than at other places. We found water in those holes to water our herds until we got as far as Granada; there the river was running a little, and from there on up it was running more, up to Las Animas. I don't think there was any running water below Granada at that time. That is the only year I was on the river in Kansas.

Cross-examination.

By Mr. ASHBAUGH:

I was along the river in western Kansas about 1882 or 1883, about Coolidge. I don't think I saw any ditches there at that time. There were none at Lamar in 1879. I have seen water in the river in Kansas. In 1882 there was water there, during the fore part of the season, about May or June. We were on the spring round-up then. At that time I remember swimming the river near Granada. One morning I remember very distinctly we had to swim the river to get across on the other side for the round-up. This was between Coolidge and Garden City somewhere, but I don't remember just the place, nor I couldn't say how long the high water lasted, but it was in June, 1882. I don't recollect that I ever saw the river in Kansas at any other time than this when there was any water in it.

3310 F. G. CURRAN, Rocky Ford, Colorado.

Direct examination.

By Mr. HAYT:

I am thirty-seven years of age; residence Rocky Ford, Colorado; I have resided here three years; occupation, agent of the Santa Fe Railroad Company at Rocky Ford. The business transacted by that road at this station I am familiar with. As compared with the years 1888 and 1889 I should judge that the business this year and previous years back to the time the beet sugar factory was installed here about five years ago is perhaps six times greater. Perhaps more. Incoming and outgoing freight charges and the passenger business for the past year approximated three quarters of a
3311 million dollars. This doesn't include the express business. The shipments of cantaloupe are greater in 1904 than in 1902.

Examination by Mr. CAMPBELL:

I think we handled about 186 cars of cantaloupes at Rocky Ford proper this year and received in freight therefrom about $175,000. This doesn't include cantaloupes shipped out by express, but the express shipments were practically local.

3313 CHARLES F. EVANS, Rocky Ford, Colorado.

Direct examination.

By Mr. HAYT:

Residence Rocky Ford, Colorado; age forty-two; have lived here forty-two years. Am connected with the American Beet Sugar Company as assistant manager. The beet sugar factory was erected in the spring of 1900. A plant costs approximately one thousand dollars per ton capacity, and the capacity of this plant is one
3314 thousand tons per day. The plant is started up about the first of October and runs until the beets are all sliced. The earliest we have ever finished was the eighth of December. We have run into February. The first year we sliced forty-two thousand tons, the second year ninety-three thousand, the third year one hundred and thirteen thousand, and the last year sixty thousand. This year (1904) we expect the tonnage will be between one hundred and thirty and one hundred and forty thousand tons. I can't give the amount of product shipped out. Approximately, we extract about two hundred and fifty pounds to the ton, of refined sugar. A great deal of stock is fattened upon the pulp and is dependent upon this
3315 industry. Pulp is a by-product of the beet sugar business. Colonel Lockhart or the Lockhart Live Stock Company are feeding a very large herd upon the by-product in this locality. Ordinarily they fatten from five thousand to five thousand five hundred head of stock and three or four thousand head of sheep. Senator Swinn is fattening a number of thousand sheep on the pulp. The Weaver and Bond Company of Kansas City have a feed yard east of Rocky Ford and they fatten on the pulp. F. M. Harrison fattens about three to four thousand head of sheep on the pulp of this factory. Those are the main industries of that kind in this place.

The farmers are allowed twenty per cent. of their beets back to them in the shape of pulp. Large herds of stock are usually brought in during October and November and are kept up
3316 until May and June, according to the market. This season there are about thirteen thousand acres planted to beets. The average production within a radius of three miles of Rocky Ford this year (1904) will be fifteen tons to the acre. The average
3317 yield in other localities will not be as great as that. The total average of the acreage that will be harvested will probably be thirteen tons per acre throughout the whole district. The farmers receive five dollars per ton for their beets. They run high in saccharine matter. The sugar beets thrive better in an arid country where they are raised by irrigation. Excessive moisture or rainfall has a bad effect upon the percentage of saccharine matter. According to our contract we prohibit the irrigation of beets after a certain time. The only time we test beets for the saccharine matter is from about the first of September on. We have no interest in the

saccharine properties until that time. Until that time we want the beets to make rapid growth, but after that time rain in the fall is very apt to start an active growth in the beet and the sac-
3318 charine matter disappears. That is the reason we claim the arid region is best for beets.

Cross-examination.

By Mr. ASHBAUGH:

The company that operates the factory here is the one that is about to enlarge its plant and build another one at Lamar. The investment in the plant at Lamar will probably be half a million. They expect to make it a five hundred ton factory. The factory here cost over a million dollars. The plant at Sugar City cost half a million, I understand, and it is a five hundred ton plant. We get the water for operating the plant from the Rocky Ford ditch and will get water to operate the one at Lamar by sinking
3319 wells. We use in the Rocky Ford plant about six million gallons per day. I can't give you the figures on what part of it returns to the river. The great bulk of it, however. I would judge ninety per cent. This would make a loss of probably ten per cent.

Examination by Mr. CAMPBELL:

We import one hundred million dollars' worth of sugar from Germany every year. The great bulk of the sugar imported comes from Germany, outside of the West Indies, Hawaii and India. We also think that sugar beets can be raised more profitably and economically in the arid region where we depend upon irri-
3320 gation rather than upon rainfall. We have two beet sugar factories in Nebraska. The beets are raised by rainfall there. There is about three to four per cent. more saccharine matter in the beets here than in Nebraska. This makes so much difference that we are just about to move one of our Nebraska plants to Lamar, and it is for this reason that we say that the arid region is better adapted for the raising of beets for the manufacture of sugar than any region depending upon rainfall.

Recross-examination.

By Mr. ASHBAUGH:

We get beets from three towns in Kansas—Deerfield, Lakin and Garden City. The quality of those beets has been very good. I can't tell how many carloads we get this year. There has
3321 been quite an acreage grown down there this year. I think the sugar beets are raised in Kansas by irrigation. I think we would have to shut our factory down if irrigation in Colorado ceased.

Recross-examination.

By Mr. ASHBAUGH:

There has not been any irrigation for beets tried in Kansas as yet. There is not sufficient acreage now in Kansas to run a plant there.

3322 Two years ago the second best tonnage we had came from Kansas. I don't know whether they had irrigation water that year or not. You can raise good beets if you can get rain throughout the spring and early summer and not have rain in the fall. It is the fall rains that are bad in a country that depends upon rain. If you can have rains just as you want them in those countries in the spring and summer you can get just as good beets anywhere in the United States as here. It is the fall rains that do the mischief.

Examination by Mr. CAMPBELL:

The consumption of sugar in amount per capita is increasing in the United States from year to year. I think that sunshine

3323 is necessary to all plant life. And this is especially true in regard to the production and growth of beets for sugar purposes. This year we have paid approximately, to the farmers in the neighborhood of Rocky Ford, Colorado, for beets, from six hundred and fifty to seven hundred thousand dollars. We employ in the sugar plant during its operation about five hundred people. Our monthly pay-roll approximates about fifty thousand dollars per month.

3324 S. W. CRESSY (Recalled), Rocky Ford, Colorado.

Recross-examination.

By Mr. ASHBAUGH:

In speaking in my testimony yesterday about seepage water from the ditches in Colorado getting back into the river, I would say the seepage water from the Bessemer ditch would return to the river all along its course down as far as the Huerfano river, and its lowest end would be in range 62 west. Bob Creek ditch would deposit seepage water back into the river along its course as far east as range 56. The seepage water from the Bob Creek canal does not return to the Arkansas river, so far as I know, east of range 58. At that point it leaves the river and there is a dividing ridge running along in ranges 56 and 57, and I don't know of any seepage water having yet found its way back to the river unless it would be into Horse creek in range 56 and passing down the course of Horse creek.

3325 The Highline ditch would deposit seepage water along its entire course as far, possibly as the east side of range 50. The Oxford Farmers' would deposit seepage water from its head down as far as the Apishipa on the west edge of range 58.

The next would be the Otero canal, which if completed and repaired so that it would use water during the flood seasons of the year, and if extended as the intention now is, would deposit seepage water as far east as range 53.

The Catlin canal would deposit seepage water as far as Timpas creek on the east line of range 56.

The next in order would be the Holbrook ditch, which would deposit seepage water into the river proper as far east as the center of range 55, and also seepage water into Horse creek along in range 54.

The next would be the Rocky Ford, which would deposit seepage water as far east as Timpas creek in the east side of range 56.

The next is the Fort Lyon canal, which deposits water along the river and also into Horse creek, Adobe creek, Gageby creek, Limestone creek, Graveyard creek, and as far east as the west line of range 45.

The Las Animas town ditch and the Jones ditch would deposit water into the river and the Purgatoire as far east as the east line of range 52.

The Colorado-Kansas, Bed Rock and Kisee ditches, which take water out of the river at the same headgates, would deposit
3326 water, as it is now constructed and used as far east as the east line of range 45. The Amity ditch would deposit seepage water into the river, Sand creek, Buffalo creek, and as far east, possibly, as the creek that empties into the river east of the Colorado-Kansas State line.

The Lamar canal would deposit seepage water, as it is now built and used, probably as far east as the center of range 43.

That is all, excepting the little ditches. The seepage water from all these canals that return water to the river west of the Amity canal would be used by the Amity canal when it needed it, unless it would be the seepage water filling up the sand of the river that don't come to the surface at that point. But if they come to the surface below the headgate of the Amity canal and by that means increase the flow of the river, they would still simply reinforce the lower ditch, if there were a lower ditch that needed water.

The main effect of all this seepage water is to increase the amount of water used by each ditch below the point where this seepage water returns to the river.

Redirect examination.

By Mr. HAYT:

3327 I don't undertake to state that that seepage water does not manifest itself lower down the stream. It is possible that there may be an underlying channel, so to speak, of sand, away from the bed of the river, as is the case back here with the Bob Creek canal, where there might be a ridge or obstruction of clay, rock, or something of that kind, and it would pass down and go into

the river away below. The only thing I speak of at the present time is as it appears right now in the case of the Great Plains storage reservoirs, where of course, there is a great deal of seepage taking place; that might go into the river immediately, or it might be carried on down into the State of Kansas in some big sandy
3328 deposit. It might go down fifty miles. Of course we know nothing about that. In speaking of this seepage water again appearing, I am only stating that in regard to places at which it has been observed.

That Fort Lyon canal is taking all the water out of the river at their headgate and has been since the first of December. The headgate is located about three miles west of La Junta and directly north of the Crooked arroyo. I think La Junta is about seventy-eight miles from the State line. The Jones ditch is carrying a small amount of water or was a week ago. The Amity ditch two weeks ago was running. I had a hundred feet turned past the Fort Lyon canal at that time to supply the Amity, but they had a break in their canal and I had to turn it out. If they have that break fixed now they are probably
3329 running what seepage water rises between the head of the Fort Lyon and the head of the Amity. The Amity ditch has recently and probably is now taking all of the water out of the river, and each one of these ditches is doing the same thing, that is, if they have use for it. If they want it they can take it as it comes to their headgate. I don't know as they have. You see that is out of my district. But the Amity I know was doing that a week or ten days ago. My opinion is—but I don't know of my own personal knowledge—that there has been water running in the river in western Kansas during this time. In my opinion the seepage water from irrigated lands in Colorado are reaching Kansas at the present time and did so during the season of 1904; and if there is a large amount of water running in the river in Kansas at the present time or during the last few months it certainly comes from seepage or out of some side stream below the headgate of the Fort Lyon canal.

LAS ANIMAS, COLORADO, Dec. 19, 1904.

3331 J. B. LYNCH, Las Animas, Colorado.

Direct examination.

By Mr. HAYT:

I reside in Pueblo, Colorado. I am fifty years of age and at the present time I am with the New York Life people. I have been a railroad man for the last thirty odd years up to the last of July and have spent the greater part of that time in Kansas. I was in the engineering department; that is, the mechanical engineering and locomotive engineering, and before that was with a civil engineering party in the very early days.

My profession in both these lines brought me along the Arkansas river. During the early part of 1867, 1868 and 1869 I was with a surveying party assisting in the survey. I assisted in the survey of the Santa Fe road from Topeka west out as far as Garden City, and then after that I was running a locomotive when I crossed this Arkansas river daily, down in the extreme southern part of Kansas, down in Sumner or Cowley county, I forget which. I was along the
3333 river about every month in those years, and my recollection is that easily four-fifths of that time the river was what you would have called a dry stream, from surface indications. Every now and again perhaps sometimes it would run four or five miles and sometimes for twenty-five miles you would not find any water at all, and then you would find a pool where it rose above the sand. That was the case except where we had local rains through the State that caused a flooded condition of the river. The rise of the river from those local rains would soon go down. I was along the river during the summer months from day to day in those years. We got our water for drinking and camping purposes generally by digging a hole down in the sand right up to the bank of the river. There seemed to be plenty of water below the sand. Sometimes it wouldn't seem to be more than two or three inches below the surface, and
3334 again a little above it. Sometimes we would find it in little pools and places. As locomotive engineer I was on the Southern Kansas division of the Santa Fe, and when I began it was known as the old Leavenworth, Lawrence & Galveston, between Cherryvale and Wellington, Kansas, and we crossed the river at a little place called Oxford. I would cross the river every day, once a day I think, for about eight years. I was on that run from 1880 to 1890, if I remember right. I have seen the river dry many times at that point—just blowing out there all over the river. No water in it at all. And then again I have seen it flooded. I have seen it dry at that point every year, and it would average four-fifths of the year. I have had occasion to observe the
3335 water flowing in there during the last eight or ten years from time to time—a great many times—and during the last ten years I have been engaged as general live stock agent for the Santa Fe, my territory extending from Newton, Kansas, to the western line of Colorado, and in following this occupation I would be along the river a great deal, and I have noticed it in reference to running water. I can't say but what there has been just as much water there in the last eight years as ever before that.

Q. From your experience and observation have you noticed any effect from the irrigation in Colorado upon the river in Kansas?

A. No sir.

Cross-examination.

3336 By Mr. ASHBAUGH:

The river was dry four-fifths of the time at Oxford—easily that. Really I believe it was more than that. I think it was nine-tenths of the time. It was dry pretty nearly all of the time at Oxford.

I don't know where the Ninnescah comes into the Arkansas. I think it is below the mouth of the Little Arkansas.

In looking at a railroad map of the State of Kansas, I guess, Oxford is below the mouth of the Ninnescah, on the Arkansas river.

Yes, we do take water out of the Arkansas river in Colorado for irrigation purposes, and yet the river is just exactly as large after you have taken the water out as it was before. I am not very familiar with the irrigation systems in Colorado.

3338 FRANK KREYBILL, Las Animas, Colorado.

Direct examination.

By Mr. HAYT:

My residence is Las Animas, Colorado; age fifty-two; am clerk of the district court and secretary of the Fort Lyon Canal Company. I have been clerk of the district court for ten years and secretary of the Fort Lyon Canal Company since 1897. I was connected with the company previous to that time. The headgate of the Fort Lyon canal is located about two miles west of La Junta. I think it is in section 32, township 23, range 55. It is sixty feet wide on the bottom at the intake, and there is six or six and a half feet of water in depth. The slope of the bank is one-to-one. The length of the canal is one hundred and fifteen miles, and it ends in Big
3339 Sandy creek. This is east from Las Animas about forty-five miles, or possibly fifty. The Big Sandy is a tributary of the Arkansas. This canal passes north of Las Animas about three miles. It irrigates about 60,000 acres. This is the number of acres under irrigation at the present time. There are 150,000 acres under the canal. Those 60,000 acres of irrigated land are in Otero, Bent and Prowers county. Quite an amount of it is tributary to the town of Las Animas; the balance of it is tributary to towns along
3340 the Arkansas river—to La Junta, Caddoa and Lamar. A great deal of the land is seeded to wheat, and sugar beets are raised quite extensively. The sugar beet industry is a growing one. The average value of lands per acre is from $45 to $50. I was acquainted with the country before this canal was built. Lands not irrigated are worth about $1 to $2.50 per acre. I am acquainted with the effect of seepage and return waters. Before the ditches were constructed I was up and down the river and the side streams were all dry previous to irrigation and there was no running water, but after the ditches were constructed and the water turned in these
3341 dry streams became all running. One of these dry streams that now runs water is called Horse creek, about eight miles

west of here. Adobe creek is a running stream; and possibly each one furnishes from two to five feet of water per second of time. There is an arroyo that we call the Gageby arroyo about ten miles due east, that furnishes about three cubic feet of water per second of time. It has been running for the past ten years, I think, and possibly longer. There is Limestone creek, twenty-five miles east of this point, which is a running stream now and furnishes possibly two cubic feet of water. And I have noticed at other points along the river the water comes into the river. It just seeps in out of the ground. I think the flow of these return waters is a little larger in the winter than it is in the summer, and it is continuous throughout the year.

Cross-examination.

By Mr. ASHBAUGH:

3342 As to how much time during the year the Fort Lyon canal has all the water it wants, it depends upon the year. Prior to 1904, I might state, from thirty to sixty days it had all of the water it wanted. That would be probably the average. During the balance of the year we have to get along with what we can get. During about ten months we could profitably use more water than we get. The Fort Lyon canal is large enough and the dam is so constructed that it can take the whole flow of the river at the average or normal stage of the river. This morning we have about four hundred cubic feet of water per second of time in the canal, and are storing it in the reservoirs of the Arkansas Valley Sugar Beet and Irrigated
3343 Land Company. That is a different system from the Fort Lyon, but we have a private arrangement with them by which we take when we can get it more than our legal appropriation and flow it through the canal. We have this arrangement so that we can take 933 cubic feet. That is the decreed appropriation now; it was 761. We went into the court at the last term and got the appropriation for 172 feet to make the 933. So that the decreed appropriation for the Fort Lyon canal at the present time is 933 cubic feet per second of time. The return waters from the whole length of the Fort Lyon canal are all west of the Big Sandy, and east of the Big Sandy there are
3344 other ditches. Horse creek, Adobe creek and the others that I spoke of are all west of the headgates of the canals lying farther east on the river. Every particle of water that returns into the river at any place I have described is subject to being taken by canals lower down the stream before it could reach the State of Kansas.

Redirect examination.

By Mr. HAYT:

Our company has an arrangement with the Amity Company to supply its reservoirs with water. The intake of the Amity canal is near Prowers station, which point is on the Santa Fe railroad
3345 about twenty-five miles east of Las Animas. The water flows through the Fort Lyon canal for forty miles and is delivered to the Amity canal at Gageby arroyo. The Fort Lyon canal is taking all the water running in the Arkansas river at its headgate. I think it has been doing so for the past week.

3346 M. H. MURRAY, Las Animas, Colorado.

Direct examination.

By Mr. LUBERS:

I am residing and have resided in Las Animas, Colorado, for about twenty years. I am about sixty-three years of age and have lived off and on in Colorado since 1863. I lived at the head of the Huerfano in 1865 and 1866. That is a tributary of the Arkansas river. During this time I have been principally engaged in stock raising and farming, and have had occasion to observe the flow of the water in the Arkansas river in Colorado and also in Kansas. In
3347 1873 at a point about six miles west of Granada the river was dry in the month of October. There were holes, I suppose, in it, but at the point I speak of Mr. Graham was working with a couple of scrapers and teams and some men making holes to water his cattle. That is what called my attention to it. This was about twenty miles from the Kansas State line, in Colorado. There was one other time that I remember, but don't remember exactly the date, when we were rounding up cattle in an early day and the Indians were fighting us and killing cattle and killing men. In that year the river was dry down there in the month of July. We were camped then on the river right opposite where Lakin is now and were camped in the bed of the stream, principally for the
3348 purpose of getting water. A Mexican by the name of Ricardo and myself while here were one day running away from the Indians on horseback, and when we came to the river bank our camp was located on a sand bar in the river and we had to dig holes there in the sand to get water. I think Mr. Holly and Mr. Pomeroy were camped there with us at that time. The balance of the people were hired men. I think Lakin is about fifty miles east of the Colorado-Kansas State line. I am not certain as to that. In December, 1863, I crossed the river this side of Bent's old fort. There
3349 were nine men, a woman and the driver, and we went across in the stage. It was a very low river then. Bent's old fort was about twelve or thirteen miles west of Las Animas.

Cross-examination.

By Mr. ASHBAUGH:

Oh yes, I have seen lots of water in the river in the State of Kansas. I couldn't just exactly locate the time, but it was between 1863 and 1873. In 1875 we had a flood of water in September, about the largest flood I ever saw in the river, except what we had this year,—the highest water. Taking the year through, I think we have had the highest water this year I ever saw in the valley east of this
3350 place, and I think we have had a greater supply this year than we ever had. The times I spoke of when the river was dry was in the extreme dry time of the year, and I think that 1873 was an extremely dry year, and I think 1863 was also extremely dry. At other times there was plenty of running water in the river down there.

Redirect examination.

By Mr. HAYT:

I have known of other times when there was very little water in the river either here or down in Kansas; and when I lived on the Huerfano, farming there, in 1865, I only got one irrigation during that year. I have seen the Arkansas river with very little water running in it in western Kansas and eastern Colorado right along in those years. The flood in September, 1875, of which I spoke, was caused by heavy rains during August and September. The rains were up west of us, I think all over the State. It was in the nature of a rain and snow storm. It washed out the Santa Fe railroad bed from here down to Coolidge.

Recross-examination.

By Mr. ASHBAUGH:

3351 I have seen the river frequently when it was low and very frequently when it was high also. It is a variable stream, and the amount of water flowing in it depends upon the general rainfall and snow fall through the State of Colorado.

3352 RUEBEN IRWIN, Las Animas, Colorado.

Direct examination.

By Mr. HAYT:

I was born in 1838; residence, Las Animas, Colorado; occupation, hotel business. I have lived in Bent county since the fall of 1871. My acquaintance with the Arkansas river extends east to Great Bend and west to the head of the Arkansas. In 1861 I was in South Park a part of the time, down about Cañon City and

California gulch, on the head waters of the Arkansas river. There was a good deal of timber on the head of the Arkansas river in 1861. In the tributaries the timber extended from Cañon City or a little above clear to the head. There
3353 was more or less timber. Sawmills were scarce in the country and very little timber was sawed except in the old-fashioned way of hand sawing. The timber extended east I would say from twenty to sixty miles along the tributaries. I wouldn't call it heavily timbered, because a great deal of it was
3354 scrubby. There was some first class timber, but as to its being heavily timbered, a person couldn't take it that way. There was a good deal of cedar and pinon, but that has been taken off for posts and wood. It shaded the ground pretty well. This protected the snow and there were places we never saw bare until after the timber was cut off. It lay all through the * * * It formed into ice but it never ran out. It was packed hard. I
3355 have been up there off and on, and the last trip I was there I believe was seven years ago this summer. I found it a great deal different. There isn't one-twentieth part of the snow in June, July and August of what it used to be before, and the timber is scarce. Practically, the sawing timber is all gone. The lack of snow in late years I attribute to want of timber. (Objection.) In 1872 I was at the mouth of Sand creek and all along the river buffalo hunting. The mouth of Sand creek is forty-five miles below here
3356 (Las Animas). The old Cimarron crossing is away east of that, or about eighteen miles west of Dodge City. In 1872 I was down at the Cimarron crossing. I was there along from the middle of June until December, back and forth at different places along the river. The river in June, July and August of that year was pretty well filled up, but in August and September it was very low. I saw it so we had to dig to get water for our stock in the bed of
3357 the creek. That was in 1872. I saw the river several times the next year, in 1873, at different places from Pueblo down to Garden City, Kansas. I was there along from September to January. The water was low in the river then. In some places there was no running water and in other places it stood in holes. Near the State line there were two or three different stock men had to scrape to get water for their stock. I mean they had to use a team and scraper. They scraped in the bed of the river. I remember one place they scraped for water was eight miles above Gra-
3358 nada, by Jim Crane's place. I think it was in September or October. In 1873 there was a rise in the river the last of June and July. I remember in several years people would leave Cañon City and Pueblo on boats, that is, little slab boats. It would run dry along down the river and leave the boats up. It wouldn't float them. The river would come through but it wouldn't float the boats. The high waters then generally came along in June and July. I saw the river frequently in 1874 and 1875. The water was low down about the State line during these years. I think the farthest down

the river I went in 1857 was to Coolidge. The river was low at that
place. In some channels there wouldn't be any running
3359 water at all and at times we could step across it. We took
out irrigating ditches just below where Lamar is now. That was in 1872 and 1873. The flume that we put on the head was six feet wide. It was pretty hard to get sufficient water for the ditch that time on account of the lack of water. I have noticed buffalo coming down to the river for water when they were unable to get it. This incident occurred between Lincoln and Sargent at one time; and then I saw it on the other side of Lakin, where they would come in and follow the bed of the river to get water. I observed this on two occasions. I have seen it at different
3360 times; that is, different herds coming in. You see there was
no end to the herds of buffaloes in those days. I never saw that except in the two years I have mentioned. One would be compelled to go two miles, to my certain knowledge, to get running water.

I have had some experience in Indian fighting. The Indians drove some of the fellows into the river, but I was farther north and didn't happen to be in the crowd.

Cross-examination.

By Mr. ASHBAUGH:

The river was dry in Kansas before they cut the timber off
3361 in the mountains. The timber they cut off in the mountains
was saw timber and mining timber and post timber. The effect of this would be to let the sun in so that the snow would melt earlier in the year. I don't know that there has not as much snow fallen in the last ten years as there did in any other prior ten years, but it has not lain on the ground but melts earlier.

The boats that I spoke of coming down from Pueblo, I have seen pass the mouth of Sand creek where I was then living. I have
seen ties floated down the river, I think in 1874 or 1875, to
3362 be sold to the railroad company. They had a boom right
above town here. I have caught fish in the river this far up by seining in the river. The fish were of a different class than we
have now. We caught a good many trout. I don't think
3363 there was any cat fish. We did our fishing in the spring
and in the fall. I suppose that these times when I saw the river dry down in Kansas were dry times of the year. In May the river was at a low stage, but not dry. There was a little running water in it. It came from the mountains. In June generally the rains and the melting snows would cause a rise in the river. Sometimes that rise would last for about forty-eight hours and there would be a substantial flow in the river along through in here or a light flow of water all the time through June and July. Sometimes during the dry portion of the year there was running water here when there was none in Kansas. I think that water sinks to

an under current down into the sand and we always find it
3364 in the bed of the river during the dry season. When we took out our ditch we had trouble in getting water for it all the time. At some times of the year there would be. That ditch is in existence, but I don't know anything about whether it gets water enough now or not. There are a good many times in the year when these ditches here cannot get as much water as they need. That ditch was about four feet wide at the bottom. These little boats I speak of were flat-boats to carry a man or two. The biggest one I ever got was made of eighteen-foot lumber, two inches thick.

3365 JOHN MURPHY, Las Animas, Colorado.

Direct examination.

By Mr. HAYT:

I am fifty-five years old; residence Las Animas; occupation printer and publisher. I am publisher and proprietor of the Las Animas Ledger. I have been publishing that paper in this town for twenty years. I have been superintendent of schools of Bent county, Colorado, from 1881 to 1889, and afterwards from 1891 to 1895.

I was acquainted with the Arkansas river in 1867. I saw the river in the State of Kansas and in Colorado from Great Bend
3366 west. I happened to be along the river at that time because I was a soldier. We were travelling as an escort to a large wagon train that came across from Fort Harker and struck the river there at Great Bend. We camped on Walnut creek for half a day. I particularly remember that place because we were camped there and four or five of us went over to the river about a mile across from where we were camped on Walnut creek and we spent an hour or two there gathering plums. There were a number of sand-dunes among the plum bushes.

As to the flow of water in Walnut creek, as I remember it now, there was some I think. Only a pool of water. I think the water was still.

In 1867 at Great Bend, Kansas, we didn't attempt to cross the river. There were large sand dunes that came down to the bank. They were covered with plum bushes, and right down close to the bank of the river appeared to be a jump-off of four or five feet, and right in close to that bank there looked to be water, probably four or five or six or seven feet wide, but the balance of the stream
3367 clear across was dry with the exception of one or two little rivulets running along through it. We could cross it dry-shod at that time, but I didn't attempt to do it right there. But farther west, probably the same evening, we crossed it, and probably we crossed it dozens of times while on that trip. We travelled about fifteen miles a day. There were ninety wagons, those large "prairie schooners" drawn by oxen. As to our own outfit, I think

we had six mule teams. We generally camped close to the river
3368 where it was handy to get water. We first came upon the river at Great Bend the latter part of August or the fore part of September, I have forgotten which. As to the condition of the river from Great Bend, Kansas, to Fort Lyon, Colorado, for a long distance, probably nearly all the way up to the Colorado line, the river was about in the condition as I said. You could walk across it dry-shod most any place. There was nothing in it but those narrow rivulets running through the sand that you could step across at any
3369 place. There appeared to be a greater volume of water in the river west of the State line. We came west to Fort Lyon—that is the new fort. The new Fort Lyon was six miles east of the present town of Las Animas, and old Fort Lyon was twenty-five miles east of the present town of Las Animas. I remember a particular incident that illustrates the condition of the water in the river in Colorado about Fort Lyon in 1867. When we came to Fort Lyon our escort duty was practically over then because the train we were on was going to New Mexico and from there they went on alone. We camped at Fort Lyon and commenced to clean up. We rigged up a spring-board right on the bank of the river below the fort. It was about eight feet above the water, and we used to run out on the spring-board and dive off into the river. I recall one other incident that illustrates the condition of the water. We remained at Fort Lyon until early in October. The regiment I belonged to was ordered west. It was ordered to New Mexico. The company I belonged to was the last one that moved. It was on escort duty with a stage between here and Dodge. They came along the fore part of October and we went on from here to Fort Garland, in which we remained for about two years; but when we reached Rocky Ford we passed up the north side from Fort Lyon and crossed the river on the south side of Rocky Ford. We had to take
3370 our clothes off to wade the stream. We took them in a bundle and carried them on our heads. This was in October, 1867. I have never seen the river in Kansas during any other year after 1867.

Cross-examination.

By Mr. ASHBAUGH :

It was about the middle of October in 1867 we had to wade the river here at Rocky Ford, and it was probably about the middle of September that we used the spring-board to dive off into the river. It was perhaps the latter part of August and early Septem-
3371 ber that we found the river dry below. I don't know whether the river was higher at Rocky Ford at that time than it had been at the time we found it so low in Kansas. It appeared to be the natural condition of the river. So when it was dry down there we found water in the river flowing here (Las Animas). So I suppose it was not a rise of water here but a sinking

away of the water below. I can't tell you what became of all that water, but from what I have read about the matter since I
3372 think it sank into the sands. It must have done so. My knowledge as to the river in Kansas was all confined to that trip.
trip. Old Fort Lyon was flooded out in the spring of 1867, and for that reason they moved the fort up the river. Bent's fort
3373 was located just east of old Fort Lyon. You might say the river ran right along the foot of it. Bent's fort was practically a part of old Fort Lyon. There was another Bent's fort of an earlier date than that, located twelve or fourteen miles west of Las Animas.

Redirect examination.

By Mr. HAYT:

3374 I didn't see the freshet in 1867. I have learned the reason for the change in the location of Fort Lyon from others. There probably were other reasons for the change, but I don't know them personally. Among the other reasons I have heard is that the land belonged to Colonel Bent and it was soon necessary to give it up, and the freshets simply hastened the change. The new location was upon the Government reservation.

LAMAR, COLORADO, December 19, 20, 1904.

3376 J. K. DOUGHTY, Lamar, Colorado.

Direct examination.

By Mr. HAYT:

My age is fifty-two; I am an attorney at law; have resided in this county since December, 1886. This county was originally Bent county, and when it was formed in 1889 I was appointed county judge and was re-elected and held the position for nearly
3377 seven years. I have been county attorney during 1902 and 1903. I lived in the State of Kansas from the fall of 1878 until December, 1886. I first located in Kansas at Larned, Pawnee county. Larned was on the Arkansas river, and I had frequent occasions to see the river during those years. I was on the river during the spring and fall frequently, hunting geese, and at other times during the year I would be there, both riding and
3378 walking. The condition of the river at that point as to water from 1878 to 1884 below what was known as Pawnee creek showed some water along one of the banks, but above Pawnee creek on the river it was dry most of the time. Occasionally there would be pools of water, but it was practically dry. The bridge across the Arkansas river is south of Larned, and Pawnee creek flows into the river between the bridge and the town. There is also a little bridge over the Pawnee, and then an island, before you reach the Arkansas River bridge. On our hunting expeditions we generally went down

the river, because there was water in the river there from this creek, but occasionally we went up the river, and at such times we would go two or three miles each way. We went down the river because there was more water and more geese.

From 1884 to 1886 I lived on a claim south of Larned
3379 about three miles. The river was between the town and my place. I crossed the river nearly every morning and night going and coming to and from town. I found the river during these years with reference to flowing water just the same as in the years before, with the exception that at flood times there would be plenty of water but at other times the river would be practically dry. The flood periods were not frequent. They occurred occasionally. The water would come up and subside again within two or three days to a week, according to the amount of water. I have seen the river dry nearly all seasons. The flood would sometimes come in the spring and sometimes in the fall, and occasionally in the summer. In 1882 a number of us organized a company
3380 for the purpose of constructing a ditch, and made the survey, and I assisted on the survey. It was between the railroad and the river bank. We went to the river bank, and after doing considerable work there we abandoned the whole project because we were satisfied we couldn't get water enough to do anything with it. That was in 1882. In 1879, 1880 and 1881 the conditions were very bad there. Crops were almost a failure. I know the condition of the country became so bad it broke me up in business. This was the prime cause of my starting the ditch for irrigation. We thought it would benefit the country and that we could raise crops with surety if we could get the water. I didn't get my farm until
3381 1883. At that time we depended entirely upon rainfall. Wherever there were any crops along the banks of the stream they were a failure, as well as otherwise. I noticed some difference in some places, and that is what we called the sand hills. We always claimed down there that the sand hills would grow crops when the other country would not, because the sand when it rained would hold the moisture longer and they could raise part of a crop, not enough to pay for the trouble of putting it in, but they could raise a little crop. The growing of crops didn't depend upon the water in the river; it had no connection with it, in fact in that country most of the farmers were on what we call second bottom, up above the river bottom. I am not engaged in farming at the present time. I own some land near Lamar, about eighty acres under ditch and about five hundred acres outside of the ditch.

Cross-examination.

By Mr. ASHBAUGH:

3382 I am not giving my attention to farming now, but practicing law. I haven't farmed any in this country. I was practicing law at Larned. I conducted my farm south of that town,

but I didn't do any work myself. During the year 1879 the river was dry more or less of the time except in flood times. That is, what I call dry. I couldn't answer how much of the year the river was dry. It would be impossible for anyone to answer. I wouldn't say whether it was dry six months of the year 1879. I couldn't tell how much of the year 1880 it was dry. I say every time I saw
3383 it—and I saw it frequently—it was dry. I wouldn't say it was dry ten months of the year, nor six monts, nor four months. As to 1881, I wouldn't answer any more definitely than I have. I wouldn't say it was dry four months of the year. I said when I saw it it was dry. As to 1882, I answer the same way, that when I saw it it was mostly dry, but I wouldn't now state whether it was three, five, seven or nine months. As to 1884, I will say, putting it all together, it would be dry—what I call dry—at
3384 least seven or eight months of the time. As far as the climate was concerned, there was more rainfall in 1884 than there had been in the preceding years. As far as my observation went the river was practically the same. I couldn't say how much we expended on the ditch in 1882. Personally, I spent $40, besides about two months' time. Several hundred dollars were expended on that work. But as to the amount I couldn't tell you. I should
3385 judge they ran the ditcher a mile or so from the river. They didn't get any water, because they abandoned the property, because they never considered they would be able to get water into it sufficiently to do any good. From my description of the river as I saw it during the five years preceding, there never has been water to go into the ditch except at flood times, and these floods would last two or three days or a week. As to whether we began an irrigating ditch with a prospect of getting water only at flood times, which would last only three or four days or a week at a time, I don't know what the idea of the other parties was. (Objection.) I went into the scheme because the rest went into it. I know
3386 there was no great flow of water in the river. As to a spring rise, I have known the river to have water in it in the spring. We call them floods. I never heard of a spring rise while I lived at Larned, and never heard the term used. I couldn't say that I ever knew a flood to last longer than a week, but right at the bridge there at Larned it might spread out a quarter of a mile to a mile from the south bank. They didn't all come from rainfall
3387 there; they all came down the river. We called them floods. They were from the section of country west of us. I never heard of it in my life during those early years that the spring rises came from the melting of the snows in the mountains or from the rains in the mountains.

I think the railroad was finished through Larned in 1876. We would go hunting in the spring and the geese would be down the river from the town in a few puddles that would be in the river. Some of the first bottom lands were cultivated then, but not
3388 as a rule. On the bottom lands in places you could strike water at five feet, in other places at ten or twelve. Crops

that were raised were corn, millet, cane and occasionally a little wheat. I never knew what alfalfa was until I came here. I never heard of it down there. I don't believe I ever heard the subject discussed as to the water in the wells on the first bottom lands being higher at different seasons of the year. I have passed through there only on the train lately. The wells back on the second bottoms would go from twenty to one hundred and fifty feet to strike
3389 water, and they didn't always strike water. On the bottom lands I don't know whether they struck water above or below the water level of the river.

Redirect examination.

By Mr. HAYT:

As to the meaning of the term "dry river," I call it dry because on these hunting expeditions I could walk the river or cross it at almost any point. There was no running water to speak of below the town where this Pawnee river emptied its water. I re-
3390 member the first time I saw the river and the impression it produced on my mind. (Objection.) I arrived at Larned at night and went to the river to see it. Prior to that time I lived in Cincinnati, on the Ohio river, and I wanted to see this river, so I went down there and found there was no water in it, and I laughed at them for calling it a river. I remember that very distinctly. I don't know of my own knowledge whether the rainfall in Kansas is greater than the rainfall in Colorado. The idea that was discussed in putting this ditch in contemplated the building of a dam across the river to turn the water into the ditch, and the land that was irrigated was in the vicinity of Larned, and after we did all the work and expended what money we had—I didn't have very much to say in the management of the company and I didn't really know when they sold the outfit. I never got any returns anyhow. I know they abandoned the ditch because they concluded it would take too much money to dam the river and they didn't think they could get a sufficient supply of water to justify the expense. (Objection.)

3392 C. P. THOMAN, Lamar, Colorado.

Direct examination.

By Mr. HAYT:

I am fifty-six years of age, am engaged in real estate and farming, and my farm is located about three miles west of Lamar, and I reside in Powers county, Colorado. I am farming about two hundred acres of land, growing alfalfa, wheat, corn, cane, oats, cantaloupes and sugar beets, and I irrigate for all of them, and without irrigation could raise nothing.

I was clerk of the district court for five years and register of the United States land office at Lamar, for four years. I located here at Lamar in October, 1886, and came from the State of Kansas, to which latter State I came in 1879 and lived there until 1886, and the biggest portion of that time I was living in Harper county, and I lived part of the time in Wichita. While I was living in Wichita in the spring of 1879, in April, May and part of June, I saw the river very frequently. I travelled from Wichita to Dodge
3394 City in a wagon up the river, and I saw it between those points all along the road. I also returned the same way. The wagon road was along the line of the Atchison, Topeka & Santa Fe railroad, and was not in sight of the river all the time but was a good portion of it. We started on the trip in April, only stayed three days in Dodge City, and returned during the same month. The country at that time was very unsettled, except at certain points, and it was very difficult to obtain water for our horses, and we generally managed when we could to go down to the river and water them, and in one instance I remember we had to dig down in the sand to get water. In some places it would be running a little in a small stream, and we found pools. It was quite low at Dodge
3395 City, and right at Wichita during the time we were there it rained for nearly three days and there was some water came down, but after we left Wichita about ten miles there was no more rain and there was practically no water in the river from there to Dodge. The Little Arkansas river brought most of the water that was in the Big river at Wichita. The water there in the river came from local rains, as it was practically dry until the rain came. I saw the river a number of times each year I lived there. Frequently between Wichita and other points along the river, and to Arkansas City, I saw the river quite often. Usually during the spring and winter and late fall the river was very low from 1879 to 1886. Frequently during the summer time there was some water in it, and sometimes there was quite a flood down in that part of
3396 the country. Down at Arkansas City when it was low it usually was probably fifty or sixty feet wide, and a very shallow stream, I should judge six or eight inches deep, and about the same at Wichita. I saw it frequently at Arkansas City. Although I lived about thirty miles west of there, I very frequently went there to trade and on other business, as it was one of my trading points.

The boom in Garden City was in 1885, and there was a great deal of rain in that part of Kansas where I lived in that year, and I drove with a wagon from Harper county to Garden City, and a great deal of the prairie between those points was covered with water from rainfall a good portion of the time, as it was raining continually, or quite often. This was in May of that year. I
3397 never heard the theory advanced in Kansas that the rainfall was extending westward. When I located in Colorado in 1886 the country was just beginning to settle up and there were no

irrigation ditches here. I know about the time the Fort Lyon ditch, the largest in this vicinity, was opened up for irrigation in 1889, and the Amity ditch has had a small amount of water in it during that time or later, about 1892. There were other smaller ditches that had some water in them prior to that time. There were no ditches in this vicinity running water prior to 1886. My
3398 observation has been that the snow fall in the mountains had very little to do with the rise in the river generally, because when the Government weather observer at Denver would report that there was practically no snow in the mountains—which was the case last year, for instance—we had an abundance of water during the entire season, caused by rainfall not only in the mountains but over the country east of the mountains. Generally speaking, everybody had an abundance of water last year, both in Kansas and Colorado.

I have dug wells on my own place and have seen a good many other wells dug. The wells that we dug early in the settlement of this country had to be dug very deep. For instance, I know of one well about two miles north of town here that was dug to
3399 a depth of one hundred and fifteen feet, and it had scarcely a sufficient amount of water to water the domestic stock. But since that time and at the present time the water has risen in the well to forty-five feet from the surface and has been standing at that depth for a number of years past. There are other wells in a great many places where the water rises to the surface on the ground where formerly it was entirely dry. The seepage water is increasing with great rapidity. All these draws over north of the river where the principal irrigation is going on are now running water. Draws or small creeks that were formerly entirely dry now run a good stream of water, and that water is returning to the river. It is also causing the river to have a greater and steadier and more continuous flow of water than it formerly had. There is Lime-
3400 stone creek over north here, I should judge about fourteen miles west of Lamar, that has a good running stream of water. Graveyard creek, ten miles west of Lamar, has a good stream of water. There is a creek called the Pleasant Valley, which was practically no creek but simply a draw, spreading out on nice, level ground, very fine land, but now there is a stream of water through it, but the land on each side of that stream has become swampy and has to be drained in order to be utilized for farming purposes. There is a stream right north of Lamar which has a good stream of water running to the river. In fact all those little streams north of the river. There is Buffalo creek. The other one there has no name; it is just simply a draw. In fact all of the draws and depressions under the Fort Lyon canal that were formerly entirely dry now have more or less water in them and a great deal of land is becoming entirely too wet, especially towards the river, in consequence of the irrigation from the ditches above. And all of this irrigated land in this
3401 vicinity drains toward the Arkansas river. A person can notice the water increasing in the river even where there are

no streams. A person can notice that all along the river bed. In fact I think it was in the fall of 1887 and 1888 I travelled up and down the Arkansas river for two miles and there was not a drop of water in sight any where. Now there is a constant stream of water running all along the bed of the river. There is never a time but what there is water there. And I attribute this to the water from irrigation. The water percolates through the soil back to the river after being used on the land. I have not been through western Kansas of late years, only on the railroad. I was along there a year ago last August, in 1903, in the vicinity of Harper county,
3402 Kansas. I sold a farm there of one hundred and sixty acres in the spring of 1886 for $3000. There was a drought there in 1866 and the price of land went down in value. I think it was in the spring of 1887 that this same land I had sold for $3000 sold for $1,800, and eighteen months after that it sold again for $1,100. I know of my own knowledge that the land in that locality since 1887 has increased in value. (Objection.) The depreciation of land values during those years was caused by the failure of crops by reason of drought, principally. When I lived in that vicinity the farmers depended entirely upon the rainfall for their crops. I was too far away from the river to possibly get
3403 any benefit from it if there was any benefit. During the time I lived in Harper county I never heard the theory advanced that the river had an effect on the crops in the locality of Arkansas City. During the years I lived there I have seen corn burn up right in the river bottom close to Wichita, and have seen crop failures close to the river there.

Cross-examination.

By Mr. ASHBAUGH:

I began irrigating here as soon as the ditches were built along here. The first ditch that had water turned in I think was
3404 in 1888. I was in Wichita nearly three months.

I should judge the Ninnescah river was from twenty to twenty-five miles distant from my place in Harper county. I have crossed it. It was a deep, narrow stream with a sandy bottom. I have seen it partly dry, but not entirely. The first time I ever saw the Arkansas river at Wichita it was just a very narrow little stream which I should judge was fifty or sixty feet wide and very
3405 shallow. This was right at the foot of Douglas Ave. in the city of Wichita. When I crossed it later in the season in the summer there was a pretty fair flow of water in it. I then crossed the Douglas Ave. bridge. It was a wooden bridge in the summer of 1879. In 1880, 1881 and 1882 I crossed the bridge almost every year two or three times, and part of the time there was a pretty fair flow of water, I should say a couple of feet deep, and sometimes it would spread over the entire bed of the river from bank to bank

and it would be two or three feet deep in the channel. When
3406 I crossed the river in 1880 I think they had constructed an iron bridge. It spanned the width of the river, and I should think was six or seven hundred feet long. I have seen the river there when the water was flowing from bank to bank. I don't know that I can say just when but I have seen it a number of times. When I went up the river in April, 1879 there was very little water in the river and no more above Hutchinson than at Hutchinson. I should judge the Ninnescah was a larger stream than the Little Ar-
3407 kansas. The water flowing under the Douglas Ave. bridge at Wichita did not come from the Little river. There was some little water coming down the river. After we went up the river it rained shortly. That was getting along towards May, and we frequently had rains there in May.

Examining Complainant's Exhibit A–1, I recognize that as a stream of water with a bridge across it, but where it is I don't know. It looks like the old wooden bridge on Douglas Ave. at Wichita that I crossed in 1879. It may be it. I think it is. I should
3408 judge the water as shown by that picture was six or seven hundred feet wide, and it may possibly be eight hundred. The water shown there was high water. I wouldn't judge it was more than two or three or four feet from the water as shown in that picture up to the bridge. I should think those lower braces that run down onto the supports below are within two or three feet of the top of the bridge. The water is now shown there twelve feet below the bridge.

3409 Examining Complainant's Exhibit A–2, that might be the iron bridge on the river. I don't recognize it from the picture. I never saw the river so high, apparently, as it seems to be as shown in this picture. As shown from that picture I wouldn't think the water was more than two or three feet below the bridge.

Examining Complainant's Exhibit A–3, that looks like the iron bridge across the river at Wichita, but I wouldn't say
3410 that it was. I crossed the bridge at Wichita in 1880 and 1881.

Examining Complainant's Exhibit A–41, that looks similar to the same bridge. The water is not as high as the other water. There is considerable water there.

In Exhibit A–41, it looks like there was much more space
3412 between the bridge than in the other pictures. The stone abutments do not show to me the same in Exhibit A–41 as they do in Exhibit A–3, because in Exhibit A–3, it appears straight up and down while in Exhibit A–41 it appears to have a jog there.

The water in Exhibit A–3 doesn't appear to be as high as in
3413 those other pictures.

When I was in Garden City in 1885 I think they were irrigating there a little. I was in Garden City only two days and didn't go to examine the ditches. The city in 1885 and 1886 was

building a great many houses. We had a tremendous boom at Lamar in 1887 and there were no ditches. The boom, as I learned it in Garden City, was because of the increased settlement of
3414 the country all over western Kansas. When they were settling up the country around Garden City for two or three years the idea was scouted that it was a dry country, by eastern people, and they took that land up in large quantities. They didn't dig the ditches where the principal part of the settlement was going on. It was five or six hundred feet above the river. It was impossible to dig ditches there. There might have been at least five ditches around Garden City in operation in 1885, but I didn't see a
3415 ditch. I heard there was a ditch before I came there. I don't think the basis of the boom at Garden City was because part of the vicinity around there was under irrigation. I think the large trade made the boom at Garden City. The United
3416 States land office was then located there. The water was turned into the Fort Lyon canal in 1889 and into the Amity a very little in 1890, and in 1892. The rainfall theory extended up as far as Lamar for a little while. In 1887 it rained a good deal here at Lamar and the idea was scouted by a good many people that it was necessary to build ditches for irrigating purposes. When I came here and before irrigation was in operation there was only very little vegetation on the land down to the banks of the river. In its natural state that condition continues down to the present.

3417 The increase in the flow of the river from seepage extends as far as I have seen it on down towards Kansas. It runs down to Coolidge and beyond that some distance, but it sinks there. It always has done so. Around here some of the ditches get all they need all the time while others do not. It depends upon the priorities of the ditches. The small ditches are the earlier in
3418 priority. The large ditches through Prowers county do not get as much water as they need during the dry season of the year. Then this seepage water that would return above the headgates of those ditches would be taken up by those ditches; but the principal ditch that takes the most of the water through Prowers county is sixty miles or more above here; that is the Fort Lyon canal. The seepage water from the Fort Lyon canal, above the headgate of the Amity canal, runs right down those streams and runs into the river without any trouble. It doesn't have to cross the Amity canal. The headgate of the Amity canal is only eight miles above Lamar, while these streams are fourteen or fifteen miles above Lamar, and the Buffalo stream I testified to near Granada, rises from the Amity canal. The seepage water from the Fort Lyon canal
3419 would be absorbed by the Amity canal, I presume. The eastern terminus of the Fort Lyon canal was in the Big Sandy creek and the eastern terminus of the Amity canal is the State line, I think. I think it crosses Horse creek. If the Amity canal extends into Kansas I think it doesn't always have water in it, but it has water in it below

Horse creek. But I haven't been down there for a year or
3420 two and may be mistaken. There are a number of other canals in Prowers county. The seepage water from the Kicking Bird canal and from the reservoirs would have to go down forty or
3421 fifty feet into the ground and under the Fort Lyon canal in order to get into the Arkansas river. The seepage from the Fort Lyon canal and the reservoir on the north side of the river in order to get into the river would have to come in under the Amity canal. The Satana canal is a feeder of the reservoirs north of here.

3422 The river sand allows a great deal of water to percolate through the soil below it, and immediately below the dam which they have constructed across the river the water rises again and runs in a stream on down below. All the seepage water which comes back into the river and flows in the river would be taken up by any ditch which is farther down the river, if the ditch
3423 needed it.

I remember there was a drought in Harper county in 1886, and I sold my land before that drought set in. I say they didn't have a good crop in Harper and Kingman counties in 1886.

Examination by Mr. CAMPBELL:

3424 I never saw the snow have any appreciable effect upon the flow of the Arkansas river. Of course when there was snow in the mountains and a big rainfall there and it turned warm, it would increase the flow. The Arkansas river gets its water supply from rainfall during the summer up in the mountains and at the foot hills and through the creeks tributary to the river. The snows in the mountains have very little appreciable effect upon the rise and fall of the river. During the summer season the source
3425 of supply of the Arkansas river is from rainfall. I have investigated that subject pretty thoroughly. The water in the
3426 Arkansas river comes from local rain storms more than from any other source. The snows in the mountains at the head of the Arkansas river melt very slowly, and when they melt I don't think they have any appreciable effect upon the waters of the Arkansas river.

Redirect examination.

By Mr. HAYT:

I want to explain that the biggest floods we have had here in the Arkansas river for a number of years came at a time of the year when there was no possibility of any snow melting in the mountains, and early in the years when, as I stated, the weather observer at Denver would report that there was practically no snow in the

mountains—which was the case last year—we have had a bet-
3427 ter rain and a better supply of water in the river than at any other time, and during the years when there was an abundance of snow in the mountains, when there was a large supply, when all the railroads were blockaded, which they were frequently,—during those years we have suffered for want of water more than in any other years. That is the reason I say it has no appreciable effect, and by that I mean all along the river down here east from Lamar. Possibly it might have an effect upon the river in the mountains or in the vicinity of Cañon City or Pueblo. (Objection.) I think it has a local effect.

In referring to Complainant's Exhibit A-2, I would judge from the picture that there is water in the river—that there is water flowing under the bridge—but as to the depth of the water I
3428 couldn't tell. It appears to me that there is water from bank to bank, but as I am not an expert in photography I am very easily deceived by pictures.

Examination By Mr. CAMPBELL:

1904 was quite a wet season. No, when I said that the melting of snow in the mountains has no effect on the waters of the Arkansas river, I am not basing my judgment on the rainfall of 1904. I have noticed that ever since I have been here, for the last eighteen years, but I only cited this year because this was one of the marked seasons. The snow and ice in those mountains melts quite slow
3429 and is a good deal like it is on the prairie. In this dry atmosphere the snow melting during the middle of the day will largely evaporate and some of it will be absorbed into the soil. During the night it freezes again, which also dries up the water, and I have seen snow fall right here on these prairies six inches deep and melt away and the ground wouldn't be wet down two inches. I have seen this frequently. I don't say that the snow fall in the mountains does not increase the water in the river to some extent, but not to a very large extent—not appreciably. In some years it increases it more than in others, but I wouldn't think as a rule that it increases one-tenth of one per cent. of the flow of the water in the river here at Lamar. I think that if we had the same amount of rainfall we would have as much water here in the summer as if there were no snow in the mountains above the Royal gorge.

3430 JOHN GORES, Lamar, Colorado.

Direct examination.

By Mr. HAYT:

I am sixty-seven years of age and reside at Holly, Colorado, and am a carpenter and mechanic by trade. I have lived here since 1875. In 1871, I lived at Byron, or what they call Granada, Colo-

rado. I lived there about a year and a half. Granada is about nine or ten miles west of the Kansas-Colorado line. In 1868
3431 I was at Fort Dodge, in Kansas, soldiering, and was stationed there about two years. I had occasion to see the Arkansas river repeatedly in 1868. I saw it and crossed it quite often, up and down. I crossed it just at Dodge, and below there too. There was water in it most of the time then, in 1868. I went farther down from Fort Dodge on a buffalo hunt and came down to Great Bend and crossed the river there dry in that year without any trouble.
3432 I expect it might be eight or ten miles from Great Bend where I crossed it dry. I went from Fort Dodge down to Great Bend and there I crossed the river. I was hunting buffalo and recrossed there and came back. What we called Great Bend then is now Larned. There is where I crossed the river. I was as low down as the mouth of the Walnut creek where it discharges into the
3433 Arkansas river, and I crossed the Walnut on that trip. I don't think I was down to the mouth then; I crossed it here on this side of the bend, and then I also crossed the creek. At the time when I crossed it at Great Bend when it was dry there was water in it at Fort Dodge. Sometimes there would be a flood coming down and there would be plenty of water. In the fall of the year there was a little water in it. There was a good stream of water running when I left there. Anybody could foot across
3434 it at that time easy enough and didn't have to swim. And as I went down toward Great Bend it got less and at Great Bend it was entirely dry. There was a pretty fair run of water at Larned, about the same as at Dodge City. There was only one trip I made through there that the river was dry, in 1868, and I went to Larned, also to Walnut creek, hunting buffalo, in
3435 those days. I was at Holly in 1882 and sometimes there was plenty of water in the river there and sometimes it was plumb dry. At the present time I am living within five hundred yards of the Arkansas river and I see it most any day I look out from my door. I can see it from the house. There has been water in the river nearly all the time for the last three years, and I claim that for the last three years there has been more water in the
3436 river than there has been for the last eight or ten years. There is more water in it now.
3437 I used to dig wells there at Holly pretty nearly every day for fourteen or fifteen years. I dug wells with pipes and I found lately there is more water in it now than there was before, in the bottom. The water level of the country has become higher. Well, a foot and a half or two feet. At my house where I lived I used to go four and a half feet; now I can get water at three feet.

Cross-examination.

By Mr. ASHBAUGH:

I live on the north side of the Arkansas river and on the east side of Horse creek, and perhaps a few hundred yards from
3438 the river, and have lived there for over twenty years. I think there was water in the river all the time in 1902, 1903 and
1904. There was more water in 1904 than in 1903, but 1904 is not the wettest year we have had since I have lived in Colorado. In about 1883 or 1884 we had about the wettest year I ever knew.
3439 In 1903 we had plenty of water here all along and all the time. I never saw the river dry at Fort Dodge or Great Bend except just the times when I crossed it on my buffalo hunt. I was down there several months. I got there in October and stayed until about Christmas. I was along the river there for three months in the fall of 1868 and saw it dry only once and that was at Great Bend.

3440 Re-direct examination.

By Mr. HAYT:

Holly is about four miles west of the Kansas-Colorado line, and there was plenty of water running in the river, horse deep, yesterday, and you can't cross it very well. Just about all bogs and plenty of water in it. Nobody can cross. My son can't cross it. He tries to cross it once in a while and he can't cross it for the last eight or ten days. I know that.

3441 HARRY S. CRITTENDEN, Lamar, Colorado.

Direct examination.

By Mr. HAYT:

I am thirty-seven years of age, and am a farmer and stock man by occupation, and reside at Coolidge, Kansas. I have lived there about twenty-three years. Coolidge is about two miles east of the Kansas-Colorado line. I lived five years at Byron, just this side of Holly, Colorado, prior to that. Byron is in Prowers county and it was formerly known as old Granada. My farm is half a mile east of the Colorado State line in Kansas, in Hamilton county.
3442 It is on the river bottom. Well, it doesn't jut up against the river bottom; there is fourteen acres of land lying in a strip between my farm and the river. I am farming forty or sixty acres at the present time and raise alfalfa, kaffir corn and cane. I take water out of the Arkansas river through the Frontier ditch, the headgate of which is located about three thousand three hundred feet west of the Colorado State line. There is no land in Colorado irrigated from the ditch. The number of acres irri-

gated under it I would approximate at 3,500. The ditch is twelve feet wide at the headgate, and after it gets onto a grade at the State line it has a six-foot fall. It is eight miles in length, and the grade is one and a half feet to the
3443 mile. I presume the ditch is nine feet wide at the top, six feet at the bottom, with a foot and a half slope on either side—a foot to a foot and a half—and eighteen inches deep. I think the ditch was constructed about ten or twelve years ago. At seasons we have difficulty in getting a full water supply. In some seasons it would be dry and the river would be dryer than at others. Such seasons occurred years ago. We have experienced no difficulty in the last three years in getting all the water supply we needed. Prior to that time there were times when there was plenty of water and at other times we could have used the water but couldn't get it. I have lived along the river for twenty-five years at that point and have had occasion to observe the flow. I have run cattle on both sides of the river and have forded it every few days for at least twenty years.

3444 There is more water flowing in the river in the last three years than there has been for a number of years prior to that. Taking it on an average, I would say there is as much flowing as there had been in any three years in one period, or more. I have seen the river dry in the earlier years. In the last three years the flow is more regular. I am speaking of the flow at the State line, at the intake of the Frontier ditch, and I attribute the flow there to seepage from irrigated districts up the valley. There was
3445 plenty of water in the river at our headgate in April last—more than we could use. I had occasion to cross the river down near Coolidge yesterday and the day before. I crossed it on horse-back and in a buggy and found plenty of water. There was a great deal of it. As I crossed the river two or three days ago the water came near running in my buggy box. It came within an inch or so of it. And the river at that point was two or three
3446 hundred feet wide and it struck the horses' bellies a little higher.

Cross-examination.

By Mr. ASHBAUGH:

I visit Garden City, Kansas, once every year or two. I was down there in August, 1903. I think I was at Lakin in April, 1903. I don't think I was farther down than Syracuse or Kendall in our county. Syracuse is fifteen miles from Coolidge. There
3447 was water in the river all the time during the fall of 1903 between Coolidge and Syracuse in places. I don't think it ever went dry. It might have been at lower stage in some places than others, but there was no time when there was no water. I couldn't say as to whether it went dry between Coolidge and Syra-

cuse in the fall of 1903. I simply don't remember of any
3448 place being dry. I have talked this over with several parties in the last day, among some of my neighbors, as to the general character of the flow. It is my impression that there was water in all the places in that territory during the fall of 1903, but I don't go to the river every time I go to Syracuse. The city of Syracuse is nearly a mile from the river. I couldn't say how the water
3449 was between Coolidge and Garden City in 1903. I didn't see it at all. I couldn't say whether the river was dry at Garden City in 1903. It might have been dry at Syracuse in August, 1903. Examining Complainant's Exhibit A–45, it looks very much like a river bridge. I wouldn't know the Garden City bridge. I never saw it only from a distance and wouldn't recognize this as the
3450 Garden City bridge. I never crossed the Arkansas river at Garden City, and I don't believe I have ever been within a quarter of a mile of the north end of the bridge there, and have never been on the river down at Garden City.

At the State line where I live I think the seepage increases the flow of the river. There are no ditches just above us to take all of the seepage for a few miles. It is true as to our ditch that there were times when we didn't get as much water as we wanted. If there was seepage coming down the river we would take it if we
3451 could get it. We take whatever we need. If there was any time in August, 1903, when we could not get as much water as we wanted, it would be about August, as that is usually a dry period. Our flow gets heavier in September and heavier
3452 later on. This year it was the heaviest in October. This has been an exceptional year with us anyway. We had a lot of water when we needed it. The total flow of the river from April down to the present time this year has exceeded that of any other during those months.

Redirect examination.

By Mr. HAYT:

The flood spoken of occurred about the first of October, 1904, and lasted several days; that is, the heaviest volume of the water, and it lasted two or three weeks, until it gradually diminished.
3453 This is the flood that washed out a part of the railroad near the mouth of the Purgatoire. This flood came from the Purgatoire. I think there was as much water, with that exception, in 1903, as in 1904. We depended on a dam in the river to
3454 get the water into our ditch. We have no rock dam; it is a sand dam and sometimes it washes out. The greater portion of our ditch is in the State of Kansas. There is 3,300 feet in Colorado and the balance of eight miles is in Kansas. We have a charter from the State of Kansas for our ditch.

Examination by Mr. CAMPBELL:

I can't really tell you what the carrying capacity of that ditch is. I have never figured it out. I think we made an appropria-
3455 tion of the water in Colorado. Not to my knowledge did we get a decreed appropriation in that State. There are no ditches between the head of my ditch and the State line. I think I began to build this ditch in 1892. There were other ditches below me in Kansas taking water out of the Arkansas river at that
3456 time. I knew of there being ditches below me. I can't tell how much water we appropriated or how much we claim. When we chartered our company which built the ditch we were interested in about 1900 acres of land. We knew that there were other ditches below us in the State of Kansas that were dependent upon the waters of that river for irrigation purposes. I couldn't say whether they were prior in appropriation to us. We have
3457 had water when those ditches below us didn't have any. We kept our ditch pretty well in repair.

Recross-examination.

By Mr. ASHBAUGH:

The name of our company is the Frontier Ditch Company, and it is chartered in Kansas and in Colorado both under that name, but I couldn't say whether we have a decreed appropriation in Colorado or not. All the water diverted from our ditch is applied to
3458 the lands in the State of Kansas and none in the State of Colorado.

Redirect examination.

By Mr. HAYT:

I have heard this ditch called the Pioneer. The water is not claimed by virtue of the charter.

3459 JOHN J. DONOHUE, Lamar, Colorado.

Direct examination.

By Mr. HAYT:

I am fifty-three years of age; I reside at Coolidge, Kansas, and have since 1881. I am a ranchman by occupation and I live on a ranch about four miles east of Coolidge and own land on both sides of the river. I live within four or five hundred yards of it. My ranch is located about six and a half miles from the Kansas-Colorado line. I raise alfalfa, kaffir corn, wheat, cane and sometimes potatoes, Irish and sweet, water melons, squashes and everything

else, and raise them by irrigation, as that is necessary on the
3460 north side of the river. On the south side my land is low land and I don't irrigate that, but generally in that section of the country crops cannot be raised without irrigation. I get my water supply from the Frontier Ditch Company, the Pioneer some people call it, but the name is the Frontier, and I am president of that company. I have been president ever since it was built except two years—about ten years I guess—and as president I generally had charge of the direction and management of the ditch. The headgate is about 3,300 feet in Colorado, west of the State line. All the lands irrigated under it
3461 are in Kansas. It never was the intention to irrigate any lands in Colorado, in fact we were too low down. We have to go a little over half a mile in Kansas before we can get the water on top of the ground. The lands in Colorado are too high to take water from this ditch. The headgate is located in Colorado. We put it there so as to get the cheapest way to build it and so we could miss the town of Coolidge, and this was also necessary in order to get the required fall for irrigation. (Objection.) During the time I have lived on the river I have had occasion to cross it frequently, from two to twenty times a week during the last ten or twelve years. I have seen it for thirty-five years every day,
3462 unless it was a stormy day, or something of that kind. During the earlier years I camped on it nearly all the time when we were going to Fort Hayes. I have seen it nearly every month. I camped on the river during 1871. In that year our home ranch was at old Fort Aubrey; that is located four and a half miles east of Syracuse. In the fall of 1871 the river was practically dry. You could cross it with a pair of boots and not get your boots wet if the boots didn't leak. I crossed it at Fort Aubrey and between there and Syracuse at difference places. I lived right on the river that year and travelled up and down it all the time. We generally ranged right close to Holly. We very seldom came across the line. I have also observed the flow carefully for the years 1901, 1902 and 1904, and the flow for the last three years has been very regular, that is, in the fall and spring, and I have had no trouble in the last three years in getting
3463 sufficient water for the Frontier ditch, but prior to that time I did. In the years 1899, 1900 and 1901 the river was so low that we couldn't get sufficient water for the ditch. Those were our hardest years. In 1902 the water was a little better. We had considerable water that year some of the time. In 1903 it was a little better, and in 1904 we had plenty of water. In 1903 there were some times we took nearly all the water in the river. We took it all when it got real low. There were other times there was more water than we could control and we would have to let it go by. In the last of June, July and part of August in 1903 there were times when there was a great deal of water running by. In

1904 we had more than we wanted—more than we could con-
3464 trol. There was a flood in the river this year. (Objection.) I don't know the exact date of the flood. I never kept any track of it. I have had occasion to notice the water in the river within the last week in the vicinity of my ranch, and it has been about belly deep on a horse. I have crossed it from two to four times a day. This has been the condition for the last ten days prior to this (December 20th, 1904), and the river was about three hundred feet wide at my place, and the average depth I think was from two and a half to three feet, in the deepest part. In the sand over the stream it would be about that deep. I should judge that the water would average about two feet over the whole three hundred feet in
3465 width. The water runs pretty swiftly at that point. During the month of April this year there was more water in the river than we could control in our ditch on account of having to dig through this sand bar to get the water, and our headgate is a little bit high. Sometimes we have to throw in sand to get it high enough to raise it into the ditch, and when there is too much water we can't control it, and there was too much in April. Dur-
3466 ing the whole month of April the channel where we took out our water I should judge was nearly two hundred feet wide and a foot and a half deep in the center. The underflow ditch, or as I believe they call it, the Buffalo ditch, was taking water out of the river above us at this time. The Buffalo ditch I should judge is seven feet wide in the bottom. I don't know what other ditches were taking out water above, if any. I think the increase of water in the river during the years of 1901, 1902, 1903 and 1904 is caused by the underflow from the Buffalo ditch and the land that is irrigated above us. I mean by the underflow the seepage water from the land above our headgate; that is, the irrigated lands north and west of Holly.

Cross-examination.

By Mr. ASHBAUGH:

3467 I happened to testify in this case because I was requested so to do by Mr. Wiley, the gentleman sitting over there. He lives at Holly. I saw him yesterday or the day before that at Coolidge. I was not subpœnaed in the case. During the year 1903 it was hardly over a week at a time that we took all the water in the river, and this occurred two or three times. I think that
3468 was about the last of May or the first of June, and again in August and September in the fall. Sometimes in the fall it is a little longer. In the fall we would take all of the water for a longer time than in the spring, because it quits running above us and the river falls and we don't get the water. The amount of water in the river depends on those rains that come. The
3469 reason why we have to sometimes take all of the water in the fall of the year is because it quits running. It don't run so

even. So that in August when we took it all there would be good seepage below us—running water below us. The next ditch above ours is the Sissom. It is about a mile above ours and it takes all of the water in the river sometimes, and did so take all of the
3470 water in the river sometimes in the year 1903. Another ditch above that is the Buffalo, and the next one above the Buffalo is the Graham, I believe, but I don't know its size. Our ditch will flow water enough to irrigate 3,500 acres of land. The headgate is twelve feet wide and five feet deep. I don't remember when our charter was taken out, but it was taken out after some of the
3471 Garden City ditches were built. I believe ours was built in 1892. We filed the charter in the same year the ditch was taken out. Five of us built the ditch and paid for it and got a charter in the States of Kansas and Colorado, both. I believe we got an appropriation in Colorado, but not to use water in Colorado, but to use it in Kansas.

3472 I was in Syracuse in 1873. The railroad was built in there in 1871 and they got some of the ties floated down the river. They broke loose in high water and everybody got them. I got some of them. They came down as far as Syracuse by the water in the river. I go to Syracuse four or five times a year.
3473 I don't know that the men at Syracuse make complaint that they cannot get water for their ditches. I heard them "kick" about it, yes sir, because we didn't keep the ditches clean. That is the only reason I heard. That is the only reason the Alamo didn't get it. It has been out-lawed, I believe, for several years. There is one below that has had water whenever they needed it. We don't take all the water; there is water rises below—seeped water. But we take all of the flow of the river at certain
3474 times. There is an underflow there and I know it and testify to it. But two or three miles west of Syracuse there is a place that it never goes dry; it comes from up the river. It disappears. It used to disappear in some places. In some places where the sand in the river is higher than at other places it flows under; then when you come down to where the rock crops out it rises up again and goes over, and there is always running water in
3475 these places. At one place this side of Las Animas I should judge the banks may be fifteen or twenty feet higher than the river, but I should think the longest place wouldn't be over
3476 three or four hundred yards. Between Rocky Ford and the State line the general slope of the country is about regular with the slope of the river, and east of the State line for fifty miles it is about the same. This continues in the valley of the river back to the bluffs. In 1904 they had very heavy rains above us and west. The Eden wreck was caused by a very heavy rain or cloudburst on the north side of the river, and at the time the Santa Fe rail-
3477 road tracks were washed out on the south side of the river it was caused by a very heavy rain.

Examination by Mr. CAMPBELL:

The ditch owned by the company of which I am the president has a fall or grade of about two and a half feet to the mile to Bridge creek and one and a half feet to the mile from there east. There is about three thousand five hundred acres under that ditch and we irrigated last year 1,200 acres. In the first year we didn't have in very much. We have never irrigated the 3,500 acres, and
3478 have never gone higher than 1200 acres I should judge.
The home office of the Frontier Ditch Company is at
3479 Coolidge, Kansas. We have no office in Colorado. We never had any meetings of our stockholders or directors in Colorado. I am certain we have a charter for a corporation in that State. We never had any occasion to have a meeting of the board of directors there. I think we have a charter there. It cost us $25, I believe. We have a meeting for the election of directors every year in the State of Kansas.

Redirect examination.

By Mr. HAYT:

I don't recollect that I ever saw this charter. I believe that we applied to the governor of the State and the officers there for a decree for an appropriation of water for the Frontier ditch. We had to pay for two papers. We had to pay for two papers—one here, I believe, that cost us $10, and one in Denver, $25. We took
3481 all of the water from the river about the last of May and the first of June, and in August sometime in the year 1903. We throw in a sand dam when we can get the water into the ditch and open a channel through the bar. That always throws it up in front of the headgate. Then we throw the sand in there and that raises the water up in front of our ditch. We never can stop all of the water, because it goes through the sand. It always runs below
3482 there. We never could stop it all. We could stop the top flow but we never could stop the seepage flowing through. Sometimes this seepage would commence within fifteen or twenty feet and it would increase as it went down. There are two Sissom ditches concerning which I testified, both small. I don't know whether they have dams at all or not. The No. 2 Sissom ditch is just about a mile above our headgate and the No. 1 is about four or five miles this side of Holly somewhere. It is about six miles above No. 2, I think, and on the south side of the river, and our ditch is on the north side. We have nothing to do with the manage-
3483 ment of the Sissom ditches.

Recross-examination.

By Mr. ASHBAUGH:

My idea of this suit is that the Kansas men wanted to stop all water from irrigation and let it flow by in the river, and of course it

would interfere with men that had money invested here. My land wouldn't be worth $2 an acre if the water was taken away from us here. I got my idea from reading the Kansas City Journal
3484 and different papers. I read the Syracuse Journal, the Holly News, and sometimes read the Pueblo Chieftain. It was my idea of the suit that the aim was to prevent them from taking water out for irrigation in Colorado and every where else.

Redirect examination.

By Mr. HAYT:

3485 If it is one of the purposes of this suit to prevent the use of water for irrigation either in Colorado or in Kansas, the people of Hamilton county in which I live I don't think would be in sympathy with that object.

Recross-examination.

By Mr. ASHBAUGH:

I refer to every man in Hamilton county that has any money invested in land here. I have talked to some of the people in the east part of the county and I think they felt the same as I do.

Examination by Mr. CAMPBELL:

The development of the western part of Kansas depends
3486 on irrigation. In this western part some years we can raise a crop without irrigation and some years we can't. The whole development in the western part of Kansas depends on getting water to apply to lands by irrigation.

3487 PAUL RICH, Lamar, Colorado.

Direct examination.

By Mr. HAYT:

I am fifty-two years of age. I am a stockman and ranchman by occupation and live at Coolidge, Kansas. My ranch is located about four miles east of Coolidge, in Hamilton county, and it fronts on the Arkansas river for a full mile. I grow on this ranch, alfalfa, broom corn, prairie hay, kaffir corn and wheat, and that is about all, and I use irrigation for raising such crops, as no crops can be grown successfully in this part of Kansas without irrigation, and we get our irrigation from the Arkansas river, and from the Frontier
3488 ditch, the same one as described by the witnesses upon the stand. At this time I am only a director of the ditch company, although I was president of the company, I think it was in 1899 and 1900. We were incorporated in Kansas and filed a copy

of our incorporation papers in the State of Colorado. It is my understanding that we just filed a copy of our articles of incorporation in the State of Colorado. We never attempted to appropriate any water in the State of Colorado, nor have we ever had any court proceedings in this regard whatever for the purpose of getting any decreed appropriation in Colorado or for the purpose of obtaining a
right to the use of the waters of the Arkansas river in that
3489 State. I was connected with the company at the time the ditch was constructed. Our manner of getting the water at that time was simply by taking what water would naturally pass in the course of the river at the State line. We didn't see why there would be any occasion for an appropriation. We had the last ditch in Colorado and there was no chance for another ditch to molest us.

I first became acquainted with the Arkansas river in about 1880, and was not interested at that time and paid very little attention to
the flow of the river for the five years from 1880 to 1885.
3490 From 1885 up to 1888 I was living at Coolidge and I had property there and was interested there more or less. I crossed the river during those years and there was water the entire year in the river at Coolidge in the years 1885 and 1886. As near as I can recollect, the river was dryer for four or five years a portion of the time between 1888 and 1892, usually in the fall of the year. I have noticed the river carefully during the last two or three years, and there has been more water on an average, in the years 1902, 1903 and 1904 than for six or eight years previous thereto, at Coolidge.

I have crossed the river frequently or been upon its banks
3491 within the last thirty days, and the water flowing by Coolidge would average, I think, a foot deep for probably 250 feet in width, and I think the grade or fall of the river at this point is about seven feet to the mile and the water runs quite rapidly. I have usually crossed the river on the bridge. I saw the river in Kansas last about Sunday a week ago, and then near Coolidge on
December 11, 1904, it would average about one foot deep for
3492 two hundred and fifty feet in width.

Cross-examination.

By Mr. ASHBAUGH:

In 1885 and 1886 there was a flow in the river during the entire year, and about 1888 or 1892 it was lower. To the best of my recollection it would average probably sixty days at that time when there was no running water. The year 1904 has been a very wet
year and more water in the river than there was in 1903. I
3493 was not at Garden City during the year 1903. During some parts of the year we have taken the entire surface flow of the river. That was in the fall and just for a few days while we were filling our ditch for irrigation. I happened to come here to testify because I am interested in water in Kansas by being an owner in a

ditch and owning land under the ditch, and Mr. Wiley told
3494 me that the commission was sitting in Lamar on this date. He told me this day before yesterday at Coolidge. This Mr. Wiley is the one from Holly, sitting to your right there. He is superintendent of the Amity Canal Company.

Examination by Mr. CAMPBELL:

The charter of the Frontier Ditch Company states the point at which the water is to be taken from the river as about 3,300 feet west of the Colorado State line, and it is for that reason that we filed a copy of the charter with the secretary of state of Colorado
3495 in order to do business in that State. I have been connected with the Frontier ditch from its inception, and we first began work on it in the spring of 1892 or 1893. I don't think the charter mentions anything in respect to the amount of water. It describes the size of the ditch, the size of the headgate, the length of the ditch, and the width.

Redirect examination.

By Mr. HAYT:

I first heard of this suit about two years ago by reading the papers. I can't tell you the exact date. I learned recently by talking with Mr. Wiley that this honorable commissioner was coming here and going about the country for the purpose of taking testimony in this case. I don't think our charter mentions the number of cubic feet, although I have not looked at it for a long time.

3497 JAMES A. BAIRD, Lamar, Colorado.

Direct examination.

By Mr. HAYT:

I am forty-one years of age, and reside at Holly, and am engaged in ranching. My ranch is located on the south side of the river about two miles west and a mile south of Holly. It fronts on the river, on the south side. Holly is on the north side. I live in Holly and go back and forth every day to the ranch, sometimes on horse-
back and sometimes in a buggy, usually in a buggy. I have
3498 been passing back and forth daily between Holly and my ranch for about three years. In high water we either go by way of Coolidge or Granada and cross the bridge between Holly and my ranch. It is about twelve miles from Holly to Granada bridge and about eight miles from Granada to my ranch, and that necessitates driving about twenty miles in high water times, and when I cross the Arkansas river by means of the bridge at Coolidge it is six miles from Holly to Coolidge and then six to nine or ten miles

from there to the ranch, and that makes a drive of about sixteen miles. Last Friday I was obliged to go by Coolidge to get to the ranch. There was so much water and ice in the river that I couldn't cross it. I crossed it on one side and it ran into my buggy body and I got one of my horses down, so I didn't try it on
3499 Friday. On Wednesday at the point I crossed it it was between three and four hundred feet in width and in one place it came up to my horse's side, nearly over the back, and ran into the buggy, and I had a rather high buggy. There was considerable ice in the water, but it was stationary. The whole channel was not frozen over. There was an open place in it. The deepest part was open and I should think that was about a hundred feet in width, and the average depth for that hundred feet I should judge was about three feet, and the deepest about three and a half, and I should think the average depth for the entire three hundred feet in width of the river was about two and a half feet. I crossed there yesterday again and it came up along my horses' sides. It came up to the bottom of the buggy. It didn't run in. That was about the same amount of water as on Wednesday when I crossed it, but there was a little gorge, probably, the day I crossed it before.
3500 The ice had frozen over on account of the storm and I think it raised the water, but it broke loose and was running. There was considerable water in the river during the month of April last. I was across it every day in April and there was considerable water, but I didn't pay much attention to it. I noticed the flow of water in the river during the years 1885, 1886 and 1887 and also in the last three years—1902, 1903 and 1904. In 1885 the river got very low. In 1886 and 1887 it had a good flow. In 1888 and 1889 and on up until 1892 the river was dry, almost, through the summer season. And then the last three years the water has increased. There is a little better flow than there was previously, and it is about uniform. Between 1902, 1903 and 1904 it is
3501 about uniform and extends over the other months during the dry period. There has been a good flow of water in all three of these years. Where I cross it there has been a good stream of water running there all of the three years. Prior to that time there was not so much.

Cross-examination.

By Mr. ASHBAUGH:

The flow of the river from 1892 to 1902 varied. Part of the time it would be very low and at other times there would be plenty of water. The river has been higher during the last week than it has been for the last month. I don't know what caused it. I
3502 was in town a week ago last Saturday, and in the evening as we came back we could notice the water was rising a little, and it has been gradually rising ever since, and it has been a good deal higher. During the month of October there was plenty of

water in it. The head of the Graham ditch is about ten miles above us, but I don't know anything about those ditches.
3503 In 1885 the river was low and in 1886 and 1887 there was a good flow; then from 1888 to 1902 the river was low, and in 1888 it was perfectly dry, and also in 1889, 1890 and 1891 it was dry. In 1891 and 1892 I was living right on the river and we had to scrape the sand there to get water for our cattle, about six miles above Holly. In 1893 it was low. I was not on the river much in 1894. In some parts of the country 1904 has been very wet since the month of April, and west of us they have had a good deal of rain, and that makes the river high, but we haven't had an unusual amount of rain with us.

3505 WILLIAM W. JONES, Lamar, Colorado.

Direct examination.

By Mr. HAYT:

I am sixty-eight years of age, a coal merchant by occupation, and I reside in Prowers county, Colorado. I first saw the Arkansas river in 1860 in the month of April, at what is now known as Leadville. It was then known as California gulch.

I saw the Arkansas river in the State of Kansas in 1868 at about the mouth of the Little Arkansas river where Wichita is now. At that time I was in charge of a wagon train loaded with Government supplies that came from Fort Harker on the Kansas Pacific,
3506 and part of it was consigned to El Reno, and the balance to Fort Sill. I was master of transportation at that time for a firm by the name of Prowers & Company, operating that wagon train. They were engaged in trading and contracting for Government supplies. I crossed the river at Wichita in that year three times, and I crossed it again in 1869. At the point we crossed it in 1868 at Wichita, there was possibly a little flowing water running in little channels along. There was no place where you could call it a general current. It was just a kind of seepage from one place to another. It made a pretty river. Looking at it from a distance it looked to be perfectly dry. There was no bridge there at that time. We just simply doubled up, putting fourteen or fifteen yoke to a wagon on the train and left half of the train back, and made two trips
3507 in that way in order to get the wagons across. I noticed it quite carefully, and a person with an ordinary pair of boots could have crossed it anywhere. I crossed it there several times without getting my feet wet. I was on a horse or mule then, but I could have crossed it, as I say, with ordinary boots without wetting my feet at all, and the condition of the river when I returned at the same point was much the same. Possibly the last time I crossed it there might have been a little more water, perhaps, than when I first crossed it in October, but then there was nothing that you would

call running water; it was just simply little puddles here and there. Wichita was not there at that time. This point was right at the mouth or just a little below, east of where the Little Arkansas comes into the Arkansas river. We went down the Little river, striking it up the stream about thirty-five miles south of Fort Harker, and travelled right down from there to the Big Arkansas river.

3508 We experienced no trouble in watering our stock in the Little Arkansas. There appeared to be considerably more water in it than in the main river. In the latter it was so shallow that the stock ran into it and muddied it and were unsatisfied with it and they chased around quite a little to get water in it. I mean by that that the water was so shallow it would get muddy and the cattle were unsatisfied to drink. If there had been water in any sufficient quantity they would have been satisfied with it.

I was not on the river from the spring of 1869 again until the spring of 1871, and then I was on the river, you might say, up to 1885. In 1871 I was handling the bridge timbers that have to be transported ahead of the construction of the road from a few

3509 miles to ten or fifteen or twenty-five miles, some of the trains ran, and then back to the material yard to reload. The time was limited in which the Atchison, Topeka & Santa Fe had to build their road to the State line in order to secure their charter, or in other words their land grant, and it became necessary for them after the legislature adjourned that spring to get a push on to get to the Kansas-Colorado State line by the first of January, which they did. They laid out a town where Coolidge is now, called Sargent, when they first came in there. My work commenced down about Ellinwood. That is below Great Bend eighteen or twenty miles. And we were on the river until up this side of Larned and west of there a ways. There the road leaves the river and doesn't strike it again until reaching Dodge City, and from Dodge I was right fairly in the river along as the road runs now. In the early part of that season there seemed to be a liberal flow of water, but by the latter part of August it seemed to get pretty scarce and you might

3510 say that water just simply stood in holes along until we got up to where Garden City is now. And that condition continued until the next spring. It didn't improve any. We didn't have any very serious difficulty in getting water for our stock. The teams I was handling, we didn't load a great many of them together, and we could always water a small bunch of stock. We couldn't water a large bunch of two or three hundred head. If we had a full train we couldn't get water, but we could for a small bunch. We got the water for the stock along the river. There might have been a place or two that we had to excavate to accommodate the stock to water. By that I mean we simply took slabs and just scooped the sand out so that it would get deep enough for the stock to drink. Generally we did this excavating along close to the bank. We found more water there usually than any-

3511 where else. At other times we got the water in water holes and there was some little running water. We just

simply luxuriated on fish after we got up in there. They were hemmed up in little holes. We could get most of them with a club. There were some very fine cat fish in there, lots of them. I was along the river more or less after that for a number of years, and ordinarily, with the exception of the seasons of 1880—that was an extremely dry year—there was no water in lots and lots and lots of places. You might have to go thirty or forty miles before you would get water enough to water an animal along the river from a point west of us ten or fifteen miles, perhaps, until you would get water down I don't know how far in Kansas. At least as far down as I was at any time. I was handling cattle. That was my business then. I quit in 1872. I quit the trading business then and engaged in cattle raising and located at Granada. I have been familiar with the water in the river from that time to the present. I have used the river as the main watering place for my stock up to 1892, and I saw
3512 it nearly every day, during the summer season at least. My judgment is that the flow has been more even in the last three or four years, much more, than it was at any time prior to that for the same number of years together, and that the quantity of water was more even. Of course we had these washouts and floods coming down, and in a little while the sand would be blowing again, in the earlier years, and there has not been so much of that in the last few years. All of the country in the vicinity of Leadville and California gulch during the early '60's—1860 and 1861—you might say with the exception of just little openings along the river occasionally was timbered and in most places it was just simply so dense that the snow that fell there was conserved by the timber until away in the spring following before it would melt any or get out of there, but that timber has been cut off years and years ago. They have cleaned off all that section of the country in and around those flats. In the vicinity of Leadville, where Leadville is now, there are thousands, yes, hundreds of thousand of acres on the head waters of that stream
3513 that everything has been cut off. Not only was this timber destroyed by cutting off, but there have been fires that get started, and on account of the cutting up of the timber for cordwood and ties and things of that kind there is left much combustible matter on the ground and when the fire gets started in it all you can do is just simply to get out of the way. You can't control it.

I have seen the sand in the bed of the Arkansas river blowing about many times.

Cross-examination.

By Mr. ASHBAUGH:

The main destruction of that timber that I spoke of commenced about the time Leadville was organized there as a mining camp, up to the time I was there. We were gulch mining in California
3514 gulch in the years 1860 or 1861. I don't think for the next ten years after that the timber was attacked much, but from

about 1871 or 1872, along there, they had commenced, and a good deal of the timber that was fit for lumber was sawed up. I presume the bulk of the timber was out of there by 1890. A good deal of the forest had been destroyed by fire since then and before that time.

The times I spoke of crossing the river near Wichita were some time in October, 1868, and I crossed it on my return trip in December of that year and the third time in January of the next
3515 year, crossing it at the same place each time, right below the mouth of the Little Arkansas. There was quite a camp of Osage Indians and half-breeds camped around there at that time. There was more water in the Little Arkansas river than in the Big river where we crossed it. The old Chisholm trail was way
3516 south and east of that. We went up on the east side of the Little Arkansas. We never crossed it at all. I didn't see the condition of the river above the mouth of the Little Arkansas at either time that we crossed it. I didn't mean to convey the idea that the water we found in the river was seepage; it was just a little kind of drainage, but there wasn't sufficient to make a current. I think there was a little island in the
3517 river right at the mouth of the Little river. I think there were trees on it, but I don't know its name. The bed of the river was just simply a bed of sand, with the exception of the lowest depressions along it, where there would be a little water. There wasn't any ferry across the river at that time. If there had been it would have to run on a sand boat. It runs in my head there was a ferry started there in 1869. I never saw a ferry there in the fall of 1869. I have not been there since. The railroad got to western Kansas on Christmas day, 1871.

I never saw any ties come down the river.

3519 Yes, we luxuriated on fish from the time we struck the river at Dodge. Below that there was too much water. Down about Larned and Great Bend and along there there was quite a bit of water. That was some time in the latter part of May. I couldn't tell you where the fish came from, but in all probability they came up the river. At least they were the kind of fish that would come up the river, and were cat fish principally, but there was not enough water in October, November, December and January for them to pass Wichita. We could have had fish down there, I suppose, if we got onto it, but I think they would have to have sand rollers under them. I quit the railroad business in 1872. The extremely dry year I experienced was 1880, and they didn't
3520 have much water this side (east) of the Purgatoire; and from there on down the river it went dry nearly the whole year round. 1885 was not much better than 1880. 1880 was the worst year by odds that we had. I don't remember that we expe-
3521 rienced any difficulty in finding stock water in the year 1874 at Granada. I think there was about the usual amount of water flowing that year as in the ordinarily good years. That is my remembrance.

I don't convey the idea that the water has been even in the river at any time, but it is more even than in years past. And
3522 this uniformity extends back to about 1894. The water seems during the last three months to have gotten back to its normal condition after the high waters we had in October, and there have been no times during the last sixty days when the river was either high or low. It has been uniform.

Redirect examination.

By Mr. HAYT:

3523 I am now speaking of the locality near Holly, say from the bridge where the Atchison, Topeka & Santa Fe railroad crosses, up to Carrollton, a space of about twelve miles. Hardly that.

The nearest headgate above the railroad bridge over the river is that of the Graham ditch. I have not been over to that ditch for some little time. Just before that flood came down they were running water in there and *they* seemed to be a liberal supply. There is enough water going by my place at the present time to fill any of these small ditches or short ditches, to run them full, if it were all turned in.

3524 AMOS NEWTON PARISH, Lamar, Colorado.

Direct examination.

By Mr. HAYT:

I am fifty-three years of age, reside at Lamar, Colorado, and am engaged in farming and stock raising. I have had my family at Lamar since September 16, 1889, and am acquainted with the Arkansas river in this vicinity and also in western Kansas. I have been acquainted with the Arkansas river since 1880, May 10 or 12, in this locality, and every year from 1880 until 1885 occasionally, and since 1885 continually. I lived in Custer county, Colo-
3525 rado, and in 1880, 1881, 1882 and 1883. I lived there practically until 1885. The drainage of Custer county is to the Arkansas river by way of Grate creek and the drainage of Huerfano county is into the Arkansas river through several tributaries coming into the Huerfano and from the Huerfano into the Arkansas. From 1885 to the present time I have been engaged in irrigation enterprises along the Arkansas river in Colorado. I have had charge or management of various ditches during these years, or some of them, and I have had occasion to notice the flow of the water in the Arkansas river during the '80's and also since 1890, and have noticed it during the last three or four years in the vicinity
3526 of Lamar, Colorado, between Lamar and the State line. Practically, there is no change in the flow of the river in

recent years as compared with the flow of the river during earlier years when I was familiar with it. Little or no change. Our flood water is more even or uniform now than it used to be. I am speaking of the flow now in the vicinity of Lamar. What we call the Big Bend country up here northwest of Lamar, at one time that whole valley was perfectly dry, tillable land. To-day there is quite a stream of water flowing. Up here at Markham's place before there was any irrigation to speak of it was perfectly dry; and the land clear across the bottom there was tillable. After the ditches were taken up and the water run into the ditch there was seepage
3527 came up that is now ditched and carried off toward the river. This is going east. I presume the Markham seepage is about two and a half miles from Lamar. Sand creek is between eleven and twelve miles from Lamar, that is, on an air line, east. The seepage has broken out there. I wouldn't attempt to tell you how much there is in feet, but there is quite a seepage, anyhow so much that it destroyed a good barn and house and they dug a ditch to carry it off. About two miles east of there in what we call the Cottonwood there is quite a seepage also. East of that, in the southwest quarter of 21, 22–24, the seepage broke out in 1893, and it has run continually since then, quite a big stream of water—quite a good irrigating head. At Buffalo creek, some four or five miles east of that, it is running continually now, when the stream used to be dry at that season of the year until after the ditch went through there. What we call Dead Man is east of that. There is another great big seepage stream coming back into the river. There may be others that I haven't mentioned, but I don't call them to mind at present.

Cross-examination.

By Mr. ASHBAUGH:

All of these gulches that I have spoken of are on the north side of the river and come down from the Amity canal. No, the
3528 first one I speak of is north of the Amity, and the seepage from that comes from the Great Bend country, up here under the Fort Lyon canal. I think the eastern end of the Amity canal at the present time where water is used is on the west bank of Horse creek, and I think the water from the Amity canal supplies some water for each of these arroyos except the first one I mentioned. I was manager of the Colorado-Kansas canal on the south side of the river and was one of the men that originally built it. We began in 1885. The Amity ditch was begun as the New Era in 1886, also the Buffalo ditch. I helped to build those three and managed them up until 1897. The flow of the river along about 1887 to 1890 was just about the same as we have now from along about the first of
3529 March until the middle of May or the first of June. There was no very material change in the condition of the river at that time or now. From June on after the rains set in in the hills we always expected our floods and our water for irrigation. A-d to the time that

lasts, it varies according to the season. If the season is wet, rains in the mountains sometimes, we have a good flow all summer. At other times we have a short supply of water. As I stated before, from the first to the tenth of March you couldn't rely on getting any water for irrigation. You couldn't rely on getting a big ditch full after the first to the tenth of March and from that along in the middle of May to the first of June. And from that until August and September we had plenty of water. Sometimes it would run up all through September. But in October and November we could count on its being scarce. The ditches then that want water during those months of March, April and the months of September, October and November couldn't get it any place other than the river, and if there was none in the river they couldn't get it. Dur-
3530 ing the dry times when the ditches didn't get a ditch full they would be compelled to prorate or rotate. Generally the latter. That condition lasts down to the present time. We have had a very exceptional run of water this season. I don't think there is but very little change in the condition of the river except that at this time of the year and near the spring, by reason of this seepage and return from these arroyos I have spoken about all along up the river, it gives a more even, uniform supply of water now than it did prior to 1880. These arroyos I spoke of flow continually.
3531 These ditches below the mouth of these arroyos that want water during the months of March, April and May and during the months of October, November and December would take it all and do take it all. These arroyos most certainly help the supply of water all along the line during the dry time of the year, even below the last ditch. The ditches below those arroyos would certainly take that water. That is, if the arroyo came in above the headgate. Certainly it would take it. That is what the ditch is there for—to take the water when they can get it. And during those months that I have named as the dry months in the spring and in the fall when we need water those ditches whose headgates are below those arroyos do take all the water that is supplied, ac-
3532 cording to their priorities. They certainly do take it all. It certainly don't affect the flow of the river below the lower headgate as much as it does the river above the lower headgate. But of course you take now after you get below the last headgate, there is some seepage comes back from that ditch. The amount of seepage that finally returns to the Arkansas river that would affect the flow during the dry season down through Kansas must undoubtedly be the amount of seepage that gets back into the river east of the last headgate.

Redirect examination.

By Mr. HAYT:

The seepage from the ditches that take water out down near the State line passes right down into Kansas. Some of it gets back im-

mediately and others follow along the trend of whatever sand
3533 or under-strata it might strike. Of course it is a matter of theory as to this water returning to the river above certain other ditches we used to have a theory here, you know, that the more water we spread on the land the more return would come and we have been waiting for it, and it is only in the last few years it has begun to show up. It takes it a long while, you know, to get back, but finally the theory was demonstrated to be correct and the water is now returning, some of it. If there should be a little water running by Holly and a large amount of water is found in the river about Coolidge, Kansas, and there has been no rainfall and no storms to increase the flow, I would lay that to the fact that Buffalo ditch empties into the river there through Horse creek, and as there is quite a drainage below Holly back into the river there would be water passing by Coolidge that you couldn't see at Holly at all.

Recross-examination.

By Mr. ASHBAUGH:

3534 They irrigated out of the Amity canal in 1886, but it was not completed at that time. The Amity canal was built and water run into Horse creek in the summer of 1889. As to whether the flow of the river was affected by turning the water into the Amity canal depends upon how much water was in the river. If there was only a little water in the river they generally turned it all in. The Amity canal was undoubtedly constructed so that it could take the whole flow of the river during the dry time of the year. If the Amity canal wanted water and had a right to take it under the law and got it, it had just that effect as to the amount of
3435 water it took out of the river. After they had put in the dam in the river at the Amity headgate when it was impossible to get more than twenty-five or forty feet—after they had put in the dam we could get sixty to eighty feet. And at the Bent ditch down here I think when they would take it all out up there they would get something like thirty or forty feet at their headgate, and they are nine or ten miles apart. When the Bent people could take all of the water out of their headgate, the X Y people would have enough by reason of the rise in the river—the seepage coming back—to fill their ditch, and they must be eight or ten miles apart. When the Fort Lyon takes all of the flow of the river at its headgate I don't know how far down the river it is dry. They can take it out until there will be perhaps
3436 eight or ten cubic feet of water left in the river that would come on down to the headgate of the Jones ditch. I don't know exactly the distance. There is easily forty or fifty feet coming out there. Then if this ditch took substantially all of it again so that it would practically be dry below the headgate, then it would gradually increase until another ditch would get something of a supply. Then if the Amity was doing the same thing it would be

practically dry, so far as flowing water is concerned, below the mouth of the Amity, as to the ditches taking all of the flow at any one place. I couldn't tell what proportion of the water used for irrigation evaporates and is taken up by plant life and what proportion becomes seepage. I have given a good deal of thought to it, but couldn't give an intelligent answer upon that question.

The Bent ditch referred to is the Lamar ditch.

3538 HARRY H. McDOWELL, Lamar, Colorado.

Direct examination.

By Mr. HAYT:

I am thirty-one years of age, reside at Lamar, Colorado, and am water commissioner of water district No. 67 at the present time. The Fort Lyon canal was taking all of the water in the river during a small portion of last April at its headgate.

3539 I remember the time during the month of April last when I came to Mr. Wiley for the purpose of getting water that was then running in the Buffalo canal for use in the X Y canal. The river bed at that time was all short of water to a certain extent and the X Y ditch didn't have any water at all. There was some water running by the Amity canal part of April. The Amity canal at that time had no water. That was for the purpose of supplying the Buffalo canal. I forget whether we turned the Lamar canal in in the latter part of April or on the very first of May. I have got this data all in my books, but they are not here. I was not expecting to be called or I would have brought them with me. The

3540 water was allowed to run by the Amity to supply the Buffalo on account of the priorities. The ditches mentioned were taking all of the water during the month of April last, in fact the Amity didn't have any water in it at all. The Colorado-and-Kansas was taking it. The ditches along the river in this vicinity now are not taking all the water. I understand the Fort Lyon canal is. I haven't been there for some time. At the time I came to borrow this water both the Amity and the X Y canals were short. They had no water running in them at all and there was no water in the river that could be used for that purpose. I know that was in the month of April.

Cross-examination.

By Mr. ASHBAUGH:

3541 It will lower the river below the headgate of a canal for it to take it all, according to how much you take out. The Fort Lyon canal can take 400 feet and the Amity can also take 400 feet. If there were 400 feet in the river and either of these ditches would take that amount, there would be left in the river about 68 feet of

seepage. This seepage comes from different places—from the uplands and from under the dams. There never has been a dam constructed but that some seepage will get under and around it. We have places in the river where the bottom is bed rock. They have never been able to put a dam down so that the solid masonry
3542 goes to the solid rock at every place across the river, and some water seeps through the sand. This is more largely true of the dams that are not constructed of masonry. Some of the water would go around the dam. I have seen times when I saw only a foot and a half of water below the Amity dam. It is a good one, or was a good one until the freshet this year. As little water seeped through or around the Amity dam as any of them. It was considered the best dam on the Arkansas river when it was com-
3543 pleted. They have had a little hard luck with it. When the Fort Lyon ditch is taking all of the water in the river there is not enough to supply the Amity if it should want its full supply at that time, unless the Purgatoire was coming in: Taking the average, ordinary, normal flow, uninfluenced by any local flood, and if at that time the Fort Lyon took the whole flow of the river the Amity would get about 65 feet of water in dry times, leaving out all other ditches. That is about what it was in the month of
3544 April. This last April was a little dryer than common, and the flow of the river was low all winter. In September, October and November, 1903, the flow was small. During that time the Amity ran about a hundred feet in September and gradually got down to less. During the ordinary flow of the river when the Fort Lyon was taking all and the Amity receiving about 65 feet, which would be all, as I stated, the Lamar canal during the month of April this year would get about 16 feet. If the Lamar canal then got 16 feet and again took it all—I have seen 25 feet in the month of May, 1903, and in the month of April, 1904, there was not to exceed ten feet, and this year it would be about ten feet. If
3545 the X Y took the whole flow, which was ten feet, the Buffalo would get about eleven feet. I mean that between the X Y and the Buffalo under the conditions described there would be about eleven feet of seepage into the river, and below the Buffalo to the State line about twenty-two feet. In this way I account for the water that is flowing in the river below when the canals
3546 above are taking all of the water. I have been commissioner of water district No. 67 since March 31, 1903. I think there are 237 miles of canals in Prowers county in operation, not including the Fort Lyon at all. The total number of miles would be about 250. The Kisee canal up here has two priorities. I have seen cards around the city here indicating that the Amity canal had two decrees. I don't know what it means. The Fort
3547 Lyon canal has two decrees, the total of which is 761 feet. It has not a decree for 933 feet, and if they carry 933 cubic feet they just take it when it is in the river. They don't take it unless district No. 67 is supplied. The decreed appro-

priation of the Amity is 283.5 feet. It claims to carry eight hundred feet when it is full, and it does carry eight hundred feet when we have floods. When we have floods the Amity and other canals carry more than their decreed appropriations; and this occurs whenever we have a flood, which is quite a number of times a year. We turn into a canal more than its decreed appro-
3548 priation because they need it for irrigation. When the conditions are favorable and no other ditch within our district is demanding it and there is more water flowing in the river than a particular ditch has a decreed appropriation for, if they want more we give it to them. That is our custom here and has been for the last twelve or thirteen years. The Amity was carrying more than its decreed appropriations in May of this year. For a few days in May it carried 600 feet. This was for eight or ten days. At that time another ditch in district No. 67 was carrying more than their decreed appropriation. I think the Fort Lyon carried more than its decreed appropriation also. The Fort Lyon is not in my district and I have nothing to do with it nor with any of the
3549 water that flows in it, although the ditch runs through my district. No other canal than the Amity in my district carried more than its decreed appropriation during any time of the year 1904. The Amity carried more than its decreed appropriation for a time, not to exceed twenty-five days, in 1903. I was not water commissioner in 1902, but I should say they carried some days more than their decree. That practice is established for two reasons—because we could use the water and get an opportunity to take it, and no other ditch was calling for it—and therefore we just turned it in.

Examination by Mr. CAMPBELL:

3550 District No. 67 of which I am water commissioner belongs to division No. 2. My duties are to see that each ditch gets its just decree. Part of my duties are to see that the ditches during the low stage of the river carry the water according to their priorities and no more than their decreed appropriations. I report to Division Engineer Chew and State Engineer Carpenter. I keep a record each day of the amount of water each ditch carries and report that to Mr. Carpenter. Mr. Chew gets the daily record.
3551 I don't keep a record of the acreage irrigated under each ditch. There is a record of the number of acres under each and every canal. I keep a record of this for my own district and report to Mr. Carpenter. I make a report of the acreage once a year; that is, the number of acres that can be irrigated, not the number of acres that have been irrigated. The water I speak of having been borrowed was loaned. Mr. Wiley, the manager of the Buffalo canal, had some water down there that was just to them and we tried to get it for a few days to put it in the X Y canal. Mr. Wiley didn't let us take it and we didn't borrow it.

Recross-examination.

By Mr. ASHBAUGH:

3552 A part of the reports I spoke of are made in duplicate, or carbon copies, to Mr. Chew. I reported the amount of water that the Amity was carrying when it was carrying during the month of May, 1904, this 600 cubic feet per second of time. I made a full report. I do not report that it is carrying just the decreed amount, whatever that may be, and make no report of the balance. No, I report the amount in the canal, whatever it may be.

Redirect examination.

By Mr. HAYT:

3553 I send these reports to Mr. Carpenter, State engineer, and they are supposed to be accurate. The Fort Lyon canal is in district No. 17, and I have nothing whatever to do with that. I go there ocasionally to see the amount of water passing, but I never measure it.

In saying that some canals have two decrees, I mean that they have got two different priorities, and that may be and usually is established by one decree of the court. The tributaries of the Arkansas river between the intake of the Fort Lyon canal and the Kansas-Colorado State line are: Horse creek, Adobe creek, Limestone, Graveyard, Buffalo and Wild Horse creeks on the north side of the river; the Purgatoire, the Caddoa, the Rule, the Mud,
3554 Dry, Clay, Granada, Wolf and Butte creeks, the Smith, Kirby and Willow Springs arroyos on the south side; and the Dead Man and the Big Sandy on the north side. The Big Bend is not a creek; it is not a drainage. The Purgatoire has some water running in it now. I never saw it but what there was some water there, is the reason I answer that question. I don't know it of my own observation at the present time, and I couldn't tell you how much was running there since the 19th day of October. I
3555 don't know what there was running there then. The Fort Lyon and Amity canals both divert water from the natural channel of the Arkansas river and are about sixty or sixty-five miles apart, approximately, by the river; that is, the Fort
3556 Lyon headgate is about that distance above the Amity. The capacity of the Fort Lyon canal is about 1,500 cubic feet per second of time.

3557 MARSENA J. MCMILLIN, Lamar, Colorado.

Direct examination.

By Mr. HAYT:

I am forty-four years of age and reside near Carrollton in Prowers county and am engaged in farming and stock raising. I have been acquainted with the Arkansas river in eastern Colorado and western

Kansas since the spring of 1878. I was employed upon the range here during the period of years from 1879 to 1886, and during a
3558 portion of the year 1883 I was on the Arkansas river from Lakin to the Kansas-Colorado line. I think it was the month of August. During this time between the points mentioned there was practically no running water in the Arkansas river, so little water that we had difficulty in watering the herd of cattle we were handling. We had to water them in the river by giving them ample time and letting them go off quite a distance back and forth along the river to find the water. The channel of the river in late years as compared with the earlier ones is very much wider.

I have noticed the flow of the return or seepage waters to the river. On the north side of the river there is an arroyo almost due
3559 north of here, a little east. I believe it goes by the name of the Graham arroyo. That was formerly dry and has now running water. The same statement applies to a place between here and Sand creek, I don't know the name, ending with a little small arroyo. The same applies to Sand creek below the Amity canal and a portion of the land east of Sand creek and the Cottonwood arroyo where there is a strong seepage, so much so that some buildings erected there in an early day when the land was dry have caved in and fallen down. The foundation gave way. This was caused by the seepage. There is the Cottonwood arroyo, which flows a continuous stream now, and several other arroyos between that and Buffalo creek flow continuous streams. So does the Buffalo; so does the Dead Man. There are times in some of these arroyos that the flow of seepage diminishes. Sometimes it practically stops, though not often. On the south side of the river Clay creek, below the Colorado-and-Kansas, flows continuously into the river now. Formerly it was perfectly dry. I notice but very little difference in the variation of the flow of Clay creek during different seasons of
3560 the year. I notice it more than the others because I cross it every day going and coming from Lamar. I should judge Clay creek is flowing from four to six feet of water per second of time. Take it on Wolf creek where there is no canal, there is no seepage—there is no flow. On Caddoa, Mud and Rule creeks between here and the Purgatoire on the south side of the river there is practically the same flow there was in the early days. I haven't been up on the north side of the river for so long I wouldn't like to say anything about it, west of Lamar. There is some water flowing in the Biggs creek, east of the Cottonwood, and it was a dry creek in former years. All of these arroyos I have mentioned were formerly as dry as any spot you could find on the prairie.

Cross-examination.

By Mr. ASHBAUGH:

3561 There are ditches below every one of the ditches or gulches I have mentioned in the State of Colorado, and these ditches

have sufficient capacity to take all of the seepage I have referred to if there was no water in the river.

3562 W. J. JOHNSON, Lamar, Colorado.

Direct examination.

By Mr. HAYT:

I am forty-eight years of age, a merchant, and live at Lamar. I have lived in Colorado some seventeen years, and have been engaged in the mercantile business here. I handle dry goods, clothing, etc. I lived at Wichita in the fall of 1878 and until July, 1881. I saw the river after July, 1881, up to 1885 in the State of Kansas, from Wichita to Nickerson. I lived at Nickerson during part of the time I was in Kansas. While I was in Wichita I was
3563 engaged in the grocery business. I was working in a grocery store and delivered goods by a supply wagon. I drove it some of the time, and in doing so I frequently crossed the Arkansas river at Wichita—every day almost. I crossed the Arkansas river in 1879 at Wichita when it was practically dry. That was during the summer and fall season. And that condition continued for a number of weeks or months, I should say for a couple or three months perhaps, at that time. That was below the mouth of the Little Arkansas river. What water was there came from the Little Arkansas. The Little Arkansas is the larger stream of the two in the sum-
3564 mer time. I saw the river frequently from 1879 to 1885. I crossed it at Wichita and Hutchinson and Nickerson, and the Arkansas in my experience during those years was generally dry or practically so during the summer season and fall. I don't know about the last year. I remember once in the fall you couldn't cross the river on account of the sand. It would put your eyes out.
3565 There was no water running in the river at that time. I crossed the river a few times in 1886 but don't remember the circumstances.

Cross-examination.

By Mr. ASHBAUGH:

I lived at Kingman, as well as at Wichita and Nickerson. I don't remember that I ever saw the Ninnescah dry at Kingman. I never remember seeing the Little river dry. There was always water in the Little river, more in the larger pools at least.
3566 The Douglas Ave. bridge was a wooden bridge when I used to cross it.

Examining Complainant's Exhibit A–1 I couldn't say that I recognize that. I would say that the water as shown in that picture was high for the Arkansas river. I can't remember anything about whether I could see the braces that support the piles at the lower end and just above the surface of the water. I would hardly say

that you could see the braces at the lower end of the piles
3567 under the bridge at high water. I wouldn't call that high water as shown there, and still it is higher, a whole lot, from the general flow of the Arkansas, I would think from that picture.

Examining Complainant's Exhibit A–2, I don't recognize it. It was quite a while ago since I had any experience with the river when it was high.

Examining Complainant's Exhibit A–3, I don't remember that; but in Exhibits A–2 and A–3, there seems to be a sand bar there very plainly, and a stream on each side. I would call it low water.

3568 Examining Complainant's Exhibit A–41, I should say that that was taken since my time. I should say that the water was low.

Exhibit A–1 shows the water below the stone abutments, and Exhibits A–2 and A–3 show the water above the lower course of stone in the abutments.

After looking at Exhibits A–2 and A–3, I would say that the water was low when that was taken, although it looks to me as if there was a current coming down on each side of the river
3569 there, which it sometimes does. I have seen it when there was no perceptible current at that point.

3570 CHARLES BOBBENREITH, Lamar, Colorado.

Direct examination.

By Mr. DAWSON:

I am and have been living at Caddoa, Bent county, Colorado, since 1871, and I am a farmer and a wheelwright by trade. I saw the Arkansas river in Kansas first at about the middle of May, 1867. I was out with General Hancock's expedition at that time when we struck the river at Great Bend. At some places where we camped upon it we would strike water and in some places we would not. In some places we had to dig down in the sand for water. We kept along up the river from where we struck
3571 it as far as Fort Dodge. There were places along the way where there was no running water. There were pools of water here and there. Where we didn't find the pools we had to dig down for water for our stock. We were on the trip about six weeks. I saw the river again in Kansas in 1868. When I left Fort Harker I struck the Arkansas river at Larned and came right up the river by wagon. The water was very low. In some
3572 places there was no water at all. I came out with a Government outfit, and had my own conveyance. There was no running water at all in some places. I think we struck a constantly flowing stream first probably forty or fifty miles east of old Fort Lyon and we followed the river up from there as far

as Pueblo and there was a flowing stream all the way up. I should judge there was less water at Pueblo than there was at Dodge. That is, at the bridge at Pueblo. There was no bridge there then; we just crossed on a log, it was so narrow. There was no running water at Dodge where we struck the river—and I mean there was more water, certainly, than at Dodge.

Cross-examination.

By Mr. ASHBAUGH:

3573 The river at Pueblo was about thirty-five or forty feet wide, and taking it through at that time I suppose it was probably a foot deep in the center. There was no place between Pueblo and Dodge where there was any more water than at Pueblo. We were on the river in 1868 from May to July. We didn't experience any high water on that trip. It must have been an extraordinarily dry season. There was no snow in the mountains, the farmers said. The snow in the mountains affects the flow of the river the following summer to some extent. I believe in September of 1868 we had a little high water from rain, but none from the melting of
3574 snows. I think there was no more water in the river in 1868 than there was in 1867. I never saw the Arkansas river in Kansas when it had any water in it. These are the only two years I ever saw the river in Kansas.

3575 A. E. BENT, Lamar, Colorado.

Direct examination.

By Mr. DAWSON:

I reside at Lamar, and have lived in this locality eighteen years. During the past sixteen years I have been engaged in farming and irrigation. I am manager of the Lamar canal and am interested in lands in this locality as well. I have handled lands other than my own, and my business has been such as to induce me to observe the general progress of the country in this locality. I am forty-two years of age, and am the auditor elect of the State of Colorado.
3576 I should say there is about 125,000 acres of land in Prowers county under irrigation, and I should say there is sixty to seventy-five thousand acres in addition under the ditch that has not yet been reclaimed. I should say that the average value of this land per acre would be from $60 to $75. Some land in some tracts would run as high as $250 an acre. I have been engaged in the real estate business and have handled irrigated lands and farming lands in Prowers county. The crops generally are alfalfa, wheat, oats and in fact all kinds of grains are raised in this latitude,
3577 also sugar beets and cantaloupes. The lands which cannot be irrigated are worth in this locality about $1 to $2 an acre,

and if the irrigated lands were deprived of water for irrigation they would be reduced to the level of the lands now above irrigation and would be worth the same amount per acre. Possibly the first bottom land would be worth as high as $3 to $5 an acre; but no crops can be grown successfully in Prowers county without irrigation. Lamar has about 1,600 population, and it is supported by the irrigation development of this country. It is what might be called essentially an agricultural town. If the lands within
3578 Prowers county were deprived of water for irrigation there would be nothing to sustain the town. We have in Lamar a modern flouring mill of 500 barrels daily capacity, and this is in operation day and night the greater portion of the year. There are sugar beets grown here, and plans are on foot for the development of the sugar beet industry. There has been this year (1904) about 5000 acres of beets grown in this county. The sugar beets grown here are now treated at the Rocky Ford factory of the American Beet Sugar Company, but there is a factory building here now for their future treatment. I have been told by the men in charge of the construction of this factory that its capacity will be from 450 to 500 tons daily. I have been interested in land lying imme-
3579 diately along the river in Prowers county since I have been here and have had occasion to observe the river during that period from year to year, and also have observed the results as to seepage or return waters from the irrigation of the uplands lying along the stream, and find that result is to increase the flow of water in the river during the dry periods or the low water periods and that it equalizes the supply of water. Some of this seepage water appears on the surface where it can be seen by anyone going along. The total volume of water during the last few years seems to have been greater than it was in former years for quite a period. I think it is caused by the increased rainfall and snow dur-
3580 ing this period. The fall and early spring flow is much greater now than it was before irrigation commenced and appears to be increasing each year quite rapidly. At the time the river is running the most water the ditches are also taking the most water. And it takes that water when spread upon the ground some considerable time to return to the stream, the time depending upon the distance from the stream where it is applied, and the character of the soil and sub-soil. All of the lands irrigated from the river within this county drain back into the Arkansas river again. The seepage or return water is increasing year after year considerably.

3581 The valuation of property in this county for taxes I should approximately give at between two and three millions of dollars, and it is assessed at from one-third to one-fourth of its true value.

Cross-examination.

By Mr. ASHBAUGH:

The sixty or seventy-five thousand acres under ditch in this county that are not now being irrigated are not irrigated because it is not settled up and the water is not being used on it. There has been a shortage of water in this county for irrigation even
3582 for the 125,000 acres under irrigation, and that condition would continue if we increased the amount to 200,000 acres. Our acreage of beets should be increased some to supply our local factory when completed. This could be done by putting land into beets that is now being used for other purposes, and I think
3583 the beets would be more profitable. I don't expect the number of irrigated acres in this county to run down because of the coming of this factory. Increasing the acreage in sugar beets tends to increase the intensity of farming. For instance, the acreage necessary for this factory to run, in a normal period, would be, in the extreme, eight or ten thousand acres. The coming of the factory will increase the farming effect in the community and will adjust itself to the crops grown and will not decrease the
3584 amount of water that we will use for irrigation, and I think it would necessarily increase it, because there are more people to use the water, and we expect the duty of water to increase at least fifty per cent. within a reasonable time. This will also cause a greater use of the water than we have made in the past, and particularly in the storage of the flood waters, in fact that is the effect that would naturally follow the best industry—the storage of flood waters—and ought to for all interests.

3585 I couldn't answer the question as to whether any return waters come into the river east of the last ditch on the eastern side of this county, because the last ditch is within a few thousand feet of the State line. There were always times every year when the ditches in this county didn't have as much water as they needed, and at those times there is quite a struggle on the part of the later ditches to get the amount of water necessary for their needs, and sometimes some of the ditches use more than their decreed appropriation. There are some irregularities creep into the management of ditches, and this is one of them, and I have known of cases where it applied to more than one ditch—when a
3586 ditch carried more water than its decreed appropriation. The Amity ditch carries more than its decreed appropriation at times. It has done it more than once. During the flood period in the river when the river is full of water the Amity frequently carries more than its decreed appropriation, and at those times they take their capacity, I presume. That is true in this particular case.

3587 Examination by Mr. CAMPBELL:

Yes, there are reservoir sites near Lamar on the Arkansas river that could be utilized for storing or impounding its flood waters. I

have made some study of the question as to the capacity of such reservoirs if they were properly built and the amount of water they would hold and the amount of land they would irrigate. The reservoir system referred to is owned by the Arkansas Valley Sugar Beet and Irrigated Land Company. It has a total available capacity as now constructed of 192,000 acre-feet. The entire system has once been filled, I believe. There are other reservoir sites in this valley that could be utilized for the purpose of storing flood waters. Some years the flow of the water would be limited and not enough to fill those already built and others in addition that are
3588 contemplated. I don't think that the reservoirs already built have been filled to their entire capacity. One cause of that is that the inlet to that system is entirely too small to fill them at the time the flood waters pass the intake. It is not because there is not sufficient flood waters coming down the river.

Redirect examination.

By Mr. DAWSON:

3589 It has never been found practicable to use the flood waters for any reservoir system in this State from the Purgatoire because it is below where it is practicable or possible to take an outlet from the river into any natural reservoir that is now known, and it is a stream in which there is a great deal of water, and especially flood waters. There are records, I believe, of large volumes of water that come out of the Purgatoire every season that are not available for Colorado at all but furnish water for a great many acres of land.

Testimony for Defendant The Graham Ditch Company.

3590 G. R. HILLYER, Lamar, Colorado.

Direct examination.

By Mr. GOODALE:

I have resided in Lamar for about six years last past, and I know the Graham ditch and the Graham Ditch Company, and knew James Graham during his lifetime. He died during the month of March, 1899. I am the administrator of his estate under the will. The Graham Ditch Company is the owner of the Graham ditch,
3591 and the estate of James Graham, deceased, is the owner of the stock of that company. It is organized under the laws of Colorado. The lands irrigated under that ditch are owned by the estate of James Graham. Still, some of them are owned by the State of Colorado and held by the estate under lease. I think there

are about 2,680 acres of deeded land belonging to this estate
3592 under that ditch. These deeded lands inc-ude the southwest quarter of the southwest quarter of section 27; the south half of the southwest quarter of section 28; the southeast quarter of the southeast quarter and the north half of the south half of section 29; the northeast quarter of the southeast quarter of section 30; the east half of the northeast quarter of section 32; all of sections 33, 34 and 35 and the south half of section 36; township 22 south, range 44 west of the 6th principal meridian. The lands leased by this estate from Colorado are the southwest quarter of the southeast quarter; and the south half of the southwest quarter of section 29; the south half of the south half of section 30; the north half of the north half of section 31; and the north half of the northwest quarter and the northwest quarter of the northeast quarter of section 32; township 22 south, range 44 west. All these lands border upon the Arkansas river and some of them extend across the river and
3593 are bottom lands. There are something over 400 acres under cultivation in alfalfa, and the balance of the land is used for wild hay lands and pasture. Practically all of it is watered from this ditch. I may add that there is one quarter section of this land that I have described that lies south of the Graham ditch
3594 and is not watered by it. That is in another township. This estate is used to raise hay for the feeding of the cattle which belong to the estate. Any kind of crops that are grown in this country, such as alfalfa, wild hay, wheat or any kind of small grain, sugar beets, etc., can be raised upon this land. They don't grow all those crops on there now but they could be grown there, but none of these could be grown without irrigation. The Graham ditch has its headgate on the south half of the southeast quarter of section 25, township 22 south, range 45 west of the 6th principal meridian, and it follows from that point a generally southeasterly course to a point about the northeast corner of the southeast
3595 quarter of section 32, township 22 south, range 44 west; thence it runs south to a point immediately north of the township line; thence east, following a line immediately north of the township line to a point immediately northwest of the southeast corner of township 22, range 44 west; from which point it runs north to the Arkansas river, and it is practically built entirely upon the lands owned by this estate. The waste water from the ditch flows back into the Arkansas river. The depth of this canal is three feet. The width on the top is eleven feet and on the bottom six feet, and it has a grade of 4.8 feet to the mile, with a carrying capacity of 61 cubic feet of water per second of time. It has a decree for 61 cubic feet of water under the adjudication in district No. 67.

The paper marked "Defendant Graham Ditch Company's Exhibit 1" shows the Graham ditch, the deeded lands and the leased lands belonging to the estate of James Graham, deceased, that are

watered by the Graham ditch, and the deeded lands are
3596 marked on the plat in blue and the leased lands are marked in red.

(Defendant Graham Ditch Company's Exhibit 1 offered in evidence.)

Cross-examination.

By Mr. ASHBAUGH:

All crops raised on these lands are raised by irrigation and no crops could be raised without it. These lands were arid lands before they were reclaimed by the Graham Ditch Company.

Defendant Colorado's Testimony Continued.

DENVER, COLORADO, January 19–23, 1905.

3597 HENRY B. SAGER, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I am fifty-four years of age; am a ranchman and stock breeder, and live at Laveta, Huerfano county, Colorado. I have lived in Huerfano county thirty-three years, in the vicinity of my present home at Laveta, not more than four miles from where I am
3598 at present located. The town of Laveta is located on the Cucharas river, and about eight miles from what we call the spur from the main range of the Rocky mountains are the Spanish peaks, which is a little closer than the main Sangre de Christo range. I have lived on my present farm twenty-eight years.

The Cucharas river is a tributary of the Huerfano and the Huerfano of the Arkansas. At the junction is is called the Huerfano river, from there down. I should think the Cucharas river discharges into the Huerfano about thirty-five miles below here, and the Huerfano empties into the Arkansas river, I suppose, about twenty miles below Pueblo.

3599 My business as stock raiser and farmer has taken me over the drainage area of the head waters of the Cucharas river very frequently ever since about 1876 and 1877, up to the present time. I have a pasture that is on the source of those streams that I am continually at more or less all summer during the last twenty-five or thirty years. On what we call the water shed of the mountains is where I have my pasture. The pasture is located above the irrigation ditches from the Cucharas river. In the winter months I am there very frequently up until the holidays, and from that and after, I should say, from the first of April on. My busi-
3600 ness as stock grower takes me sometimes, but not so frequently, to the head waters of the Huerfano, and I am familiar

with the country below the mountain range between the Huerfano river and the Cucharas river. As a stock raiser I have had occasion to notice the precipitation of rain and snow upon those mountains at the head waters of the two streams mentioned. The amount of precipitation, more particularly of snow, during the last four or five years, since 1900, as compared with the earlier years during which I have been familiar with that country, according to my judgment, has been fifty per cent. less than it was during the '70's and '80's, and since say 1887 it has been gradually depreciating, the
3601 precipitation of snow especially, and I should judge that the precipitation since 1900 is forty per cent. less than between 1890 and 1900, comparatively. I have also noticed lakes that were formerly filled with water that are now dry. The first is on the summit of the Sangre de Christo range, about two and a half miles south of where the present Denver and Rio Grande railroad crosses the main summit. That constitutes, I should say, an area of about six acres that was usually covered to the extent of four to six acres continually the year round; but the last four years to my personal knowledge, it being near my pastures, there isn't any water in it except where a flood or rain comes in the summer. That perhaps is gone in two days, and up to 1887 I never did know it to be dry. It would perhaps stand three and a half feet in the deepest in water. This lake was filled by the drainage of a large park, and it had no outlet at all.

There is another lake about two miles south of this one I have mentioned that does drain into the Cucharas river. I suppose the area would be about two-thirds of the first one, and it always
3602 contained water up until four years ago, and had an outlet running out of it to what is called Middle creek, and from that to the Cucharas river, and for the last three years it has been dry.

Again, right along this chain or range extending south for, we will say, five or six miles, there are various other lakes in the same condition now. I will say three or four others that I have personal knowledge of, right in the mountains near the head waters of the Cucharas. The creek I live on lies a little south of Middle creek, that doesn't hardly run out of the mountains any more. In the early years it had plenty of water from its source to where it emptied into Middle creek, about a mile from Laveta, and it doesn't run any more by my ranch except a little, perhaps, in the spring, and
3603 it hasn't for four years. That leaves about four miles of a dry channel where formerly the stream ran. During the summer months in the earlier years according to my judgment there would be about four or four and a half cubic feet of water in this stream, plenty for stock and other purposes, and for irrigation too. I had ditches from it in the earlier days. This is Indian creek that we are talking about now. On the west of the Cucharas river we might drop back north yet to where we began this Middle creek and call to memory another stream that is called the South Abeyta,

which is a stream about as large as the two first mentioned,
3604 and is about the same length of source from the main range. It likewise has been dry most of the year, although I expect it has furnished perhaps a little more water than the others, but it never runs any water now. It hasn't run for say four years, except a little freshet in the spring. It empties into the Middle creek there by my ranch. Prior to 1900 there was plenty of water in this stream for all necessities.

There is another stream; we will say it comes in on the east between the two Spanish peaks on the east side of the Cucharas, a tributary about as large as those mentioned. It is called the Wahatoya. I would say that it has depreciated in its facilities for supplying water just about the same as those others mentioned.
3605 It is about ten miles long, and there was irrigation from that stream during the earlier years. The Wahatoya creek must have supplied water for eight or ten quarter sections of land at least, and maybe twelve, that I could call to memory, and there were families living upon those quarter sections and cultivating the land in those earlier years, and since 1900 those lands have been very short; they haven't produced fifty per cent. of what they usually did. I might mention four or five of these quarter sections on the head or source of this stream that got a little water; and from that down the others, for the last four or five years, haven't had hardly any water at all, being dry. There is another one east of that yet, I would say eight miles, which empties into the Cucharas still farther down. It is named Bear creek. My experience has been, prior to 1900,—there are two or three large ranches that I know of that produced large crops of hay and grain, but since that time their ranches or land has been only for pasture, comparatively.
3606 On account of the shortage of water they couldn't produce any crops. During the time they were producing crops they were irrigating from this Bear creek. I never had occasion to travel up and down that creek prior to 1900 that I remember of, but there was plenty of water in it for all uses, and since 1900 most of it has been dry.

We could go on about six or eight miles farther east and we will strike what is called the Santa Clara, and as far as my personal knowledge goes at present, and not being so frequently on that stream, I couldn't say as accurately as with reference to the others, but I know it has also been in about the same condition, and it usually was a good deal larger stream than any of these others mentioned. It supported more irrigation in the former years.

All of these streams I have mentioned are tributaries of the Cucharas river.

3607 When the stream began to dry up I had my stock yards where they could always use water out of the stream during the winter and summer. We always had plenty of water. Finally I had to resort to digging for water in a well. At first I dug a well in my yard about twenty feet deep for domestic use and drove my stock to

another stream, and I continued using water out of that well for domestic use up to 1899. In 1899 this well went dry also. I had used it about eighteen to twenty years prior to that time, and it always furnished sufficient water. After going dry in 1899 the water didn't come back any more. It was not filled or anything for perhaps over a year, and I went to work and had another well dug about eight hundred feet from this well and I dug it about eight feet square so that I could get water enough for domestic use and
3608 also for the farm animals, and I dug that within a few inches of twenty-six feet and found water, and it has remained plenty ever since. I have a gasoline engine for motive power to get water from that well, and I flow water with a pump into a stone cistern for my domestic use in the house. I have a gravity line system that furnishes water directly to the house. I have large wooden tanks right by the well that I pump full with this engine for the cattle, and I have been compelled for the last four years to use this for those purposes and for the little garden we have.

I was on the Arkansas river in the western part of Kansas in September, 1873, about the middle, I think. I was returning at that time to Missouri and I had to go to Pueblo and go from there
3609 to the nearest railroad, which then was Granada, Colorado. From Pueblo to Fort Lyon there was at that time hardly any settlement. I went by team and wagon. There was no staging at that time on that road. I travelled continually upon the Arkansas river to Fort Lyon and from Fort Lyon to Granada, which was the terminus of the Atchison, Topeka and Santa Fe road. I rode in a stage for a distance of fifty or sixty miles right down the river. There was at Pueblo at that time what I would call a reasonably good supply of water for a river of its size, but when I came to Fort Lyon I wouldn't think there was half as much water, apparently as there was at Pueblo, but it was wider out. The banks were lower and it appeared to spread wider and wider. There was a little channel here and a little one there in places. I didn't par-
3610 ticularly notice it where I struck the railroad, only going down on the stage I noticed that there was less water the farther down we went. After leaving Granada I was continually looking out on both sides of the train, and I distinctly remember somewhere between there and Dodge City, where we were running immediately parallel with the river, that the river was dry. There was just a wide sand bed across it and the river bed was sandy and dry except in a few instances where there would be a pool, say as long as this room, just standing still. Quite sufficient, it looked, to water some stock. It wouldn't be wide, but long. And then there would be perhaps half a mile, maybe only a quarter of a mile or something like that, we would notice another one. It might be as large or only half as large. And so on right down until we left the river. There was no running water between these pools, any more than there is on this floor.

3611 Cross-examination.

By Mr. ASHBAUGH:

My well went dry in 1899. Then I dug another one in 1901, and it went dry and it is dry to-day. I noticed that some of these streams began to get lower about 1900, and I attribute it more than anything else to less snow fall during these years in the winter time.

3612 I know that because it used to be so that I couldn't get over the mountains, even on horseback, and in these recent years there was nothing to prevent my going. It is my judgment that during the last four years there is less snow fall than during that time. They used to have toll roads through those mountains where they had to keep from twenty five to fifty men shovelling to get through, and there has been nothing like that since. I know of no other cause that would account for it. I know also that we have had less rainfall in the summer now than we had then. I don't know whether the weather service shows less rainfall up there or not. My statements are just based upon my own observation.

3613 Yes, I saw the Arkansas river in September, 1873, and I found plenty of water at Pueblo. Not so much at Fort Lyon; perhaps one-third less. By the time we got down into Kansas there was no running water. I suppose it had soaked down under the sand or evaporated, one or the other. But the whole amount that I saw flowing in the river between Pueblo and Granada couldn't have evaporated, of course.

3614 SAMUEL N. JOHNSON, Denver, Colorado.

Direct examination.

By Mr. DAWSON:

I am forty-six years of age, past, and reside at Durango, Colorado, having lived there about seven years. I am justice of the peace, and have lived in Colorado since May, 1875. In coming to Colorado I came over the Santa Fe railroad from Topeka, Kansas, to Granada, Colorado, and first became acquainted with the Arkansas river in that year. We travelled from down ten or twelve miles below the Kansas-Colorado line to Pueblo or Cañon City, Colo-

3615 rado, along the river. In the fore part of the summer, in May, June and up until along in the middle of July, there was a good deal of water flowing in the river at that time. Along about the first of July it began to diminish. In the fore part of July I was near Fort Lyon, and I remember that about the 20th the river had gotten very low. There came a rainy spell. It rained about four or five days, and there seemed to be a general rain all over the country. The river got up very high and overflowed its banks. After that rain was over it cleared up and the river ran down very rapidly, so that about the first of August it was scarcely

running at a point on the river about seven or eight miles above Granada near the mouth of what we called Wolf creek at that time, and there was very little water running. Of course there were holes
where there was considerable. I was down between that and
3616 the 15th of August about ten or twelve miles below Holly,
and down there at a little island in the river the river was dry completely—no running water. There was some water in holes. I know we considered the water in holes too stagnant to use and we dug for water in the sand in the bed of the stream, to get water for camping purposes. I was along there about a week and there was no increase of water during that time, and then I came back up the river to Pueblo and there was running water a little above Las Animas. That was the first place I noticed the water was running, and it was running at Pueblo; and the farther we came the more water there was. At Rocky Ford I remember crossing the stream on foot and I had on shoes and didn't get my feet wet, but up at Pueblo there was a pretty fair flow of water. I was
down the river in the months of July and August, 1876, and
3617 the river was low. Just below Granada there was a little
bit of water running, just below the railroad bridge there, probably half a mile. The stream was not over four or five inches deep and probably four or five feet wide. It was from three to four idches deep in the deepest place. And down at this island I spoke of, I wouldn't be positive whether there was any running water there or not.

The next year, 1877, I was there about the same time of the year. The river was running at the State line. But in one of those years it was dry. Two years out of the three I was down there the river was dry at that point. One year there was a little bit of water.
The farthest east that I was on any of these trips was about
3618 twelve or fifteen miles below the Colorado line. I was round-
ing up cattle at that time. We had a camping wagon and mess wagon along and depended upon finding water in the river for camp and stock purposes, and on account of this way of living I had more opportunity and reason for observing the condition of the river.

I was on the river in the summer time after that until the summer of 1890. That summer I went down the Arkansas river from Pueblo to Garden City, and there was more water at the State line than there was at the times I had been there before, a little more, but at Garden City I left the river and pulled north to the Smoky Hill, because there was no water in the river.

Cross-examination.

By Mr. ASHBAUGH:

When I was there on the river in Kansas in 1875 there was
2619 flowing water within seven or eight miles. Ths increased
as we went up the river. I presume this water sank into the

3620 ground. There were no irrigating ditches of any size. During months of May, June and July, 1875, there was considerable water, and it began to fail along in July. In the spring of the year, generally up to July, there is usually considerable water. It comes from the mountain sheds of the Arkansas river in the mountains, and it has increased in amount during these months because of the melting of the snows in the mountains. It sometimes rises and comes up and there will be water for a few days from rain in the mountains. There is this difference—that the high water from the rains comes more suddenly than the high water from the melting snows. When there is high water in the river for as much as two or three months during May, June and July it is pretty good evidence that it comes from the melting snows in the mountains. (Objection.) And when there is a sudden flood and the river comes up within a few hours and runs down within a few hours, that is very good evidence that it comes from the rains. These are prevailing characteristics of this river so far as I know, and are based upon my observation.

Redirect examination.

By Mr. DAWSON:

3621 As the river approaches the mountains it has a great many tributaries in from different sections of the mountain ranges, and these rains usually are not a general rain over the country; they are local rains, and they often occur at the heads of the various tributaries.

3622 GEORGE W. THOMPSON, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I am sixty-seven years of age and reside at Sopris, Las Animas county, Colorado, above Trinidad about five miles, and I am somewhat interested in the mining business now. Mostly I have been stock raising. I have been a farmer and have bred some stock. I have lived in Las Animas county about thirty-seven years. I came here in 1868. I was sheriff a couple of terms, and county commissioner three terms,—twelve years. I was county commissioner from 1870 to 1882. I was sheriff just preceding that.

3623 Trinidad is located on the Las Animas river, or the Purgatoire. The Purgatoire is a tributary of the Arkansas and empties into it about a hundred miles from Trinidad, I think. My business as a stock raiser has taken me somewhat over the area drained by the head waters of the Purgatoire during the years I have lived here, but my stock interest was mostly east, although I had some stock that ran about Stonewall and up to the foot of the

mountains. Sometimes my stock scattered that way, and then I was up that way fishing once in a while, and for these reasons I have had occasion during these years to notice the snow fall on the head waters of the Purgatoire river. I have been up there several times since 1900 and there is not nearly so much snow since 1900 as before. The snow seemed to be deeper up in that country
3624 in earlier years and more of it, than there has been in late years. I have noticed this effect upon the smaller streams that go to supply the Purgatoire river. On Long's creek that runs in about a mile from our ranch; and then there is Riley cañon and Burrough cañon and several of those cañons than run into the Purgatoire. There isn't nearly so much water in them as there used to be. And as regards the lakes, I didn't notice them very particularly, but I did notice up about Stonewall that there are some lakes there that of late years there isn't much water in them, so much as there used to be. Above that is what is called the Stonewall, that runs across.

On my cattle range—I settled there in about 1864—there
3625 were some lakes with two or three acres of water in them then, and they have entirely dried up since 1900.

I am considerably acquainted with the Arkansas river, because my ranch was up east of there, and I had occasion to drive my beef cattle down to Dodge very often, and past Granada, and down to the Arkansas River market. Before I moved to Trinidad I was along the river. I went down there with a man by the name of Foster, in about 1862, in eastern Kansas. I went by way of Bent's fort and old Fort Lyon and on down past where Granada now stands, near the State line, and then went to Dodge, on that trip. We had some horses, and there were some soldiers down at old Fort Lyon, and we went on rather a trading expedition. We travelled with a wagon and camped out over night along the river.
3626 Where we struck the river, about Pueblo, as we went down the river the water got scarcer, and when we got below the State line it commenced getting pretty low between that and Dodge, and when we got down to Dodge there was not very much water in the river. We found it dry at one time when we went there, in 1862, along down there. It was perfectly dry in places. We walked across it. There were holes, though, standing, that we could water our stock from, and we dug some holes to get water out of the sand to use. It was a little better than the water that stood in holes, after it settled. There was more water right along by the State line. The holes were bigger and it was running more at Dodge. As we got down say fifteen or twenty miles below the State line there was less water than at the line; but after we got say fifteen or twenty
3627 miles it was practically dry clear on down. Of course we had plenty of water to use and for our stock, but it was not running to amount to anything. It was, I think, about the fore part of August, 1862.

I was along the river again in 1864. I had a few stock I bought

over at Las Animas, and I reached the river at Las Animas and went as far as Dodge on that trip. I found the river just about the same between Las Animas and Dodge City. I don't think there was much difference. It was practically dry about Dodge City and for a hundred miles west. I think this trip was in September.

3628 I was not along the river again to pay any particular attention to it until 1872. I believe I drove cattle down there in 1871. That was the year. I drove them from my stock ranch on the Mesa de Mar and struck the Arkansas river at the State line and drove on down to Newton, Kansas. I found the river very low all the way from the State line down. There was some water at the State line, enough to water on, but as we went down the water got lower and the river got wider and sandier. It was dry in places and running in rivulets along a foot or so wide in places and a few inches deep, and then in a quarter of a mile from there per-

3629 haps there would be holes, and then below that you could cross over these rivulets without wetting your feet. Sometimes two or three of those rivulets would run only an inch or so deep. An animal could hardly water out of them without sucking up the sand. In 1878 I returned on the Arkansas river with a bunch of cattle later in the season and I found the water still lower. I came from Wichita with the cattle. I got down there along in August and returned in September. It was away in October before I got to my range, and I was along the river a good part of October. The river at Great Bend down to Wichita that year was very low. I should say about as I have described it before, most all the way down, after you got below Granada. In 1877 I drove these cattle to Great Bend and grazed and held them there for two or three months on the open market before shipping. The river that year was low. We grazed our cattle by Great Bend, on the south

3630 side of the river mostly, and it was about as I have previously described it. I drove down there after that pretty nearly every year up to 1886. I drove my beef cattle down to Dodge. I would strike the river about Granada. I would generally start with my cattle about the middle of July and graze along, and it would be perhaps August before I would strike the Arkansas river. There was about a hundred miles that I went down Rule

3631 creek before stricking the State line. Then I would drive down the Arkansas river about two hundred and fifty miles to Dodge. When we would get down there the nearer we got to Dodge the lower the water was. At times they couldn't water only in these holes and we would have to hunt them. Sometimes they would be a mile or so apart where there was good watering places for the cattle.

Cross-examination.

By Mr. ASHBAUGH:

The last time I drove cattle down there was about 1886, and we struck the river about the middle of July. We generally travelled

on the north side of the river. I suppose we went along close
3632 to where Garden City is now. I don't recollect about any ditches being there in 1886. I don't know whether there was or not. If there was running water in them I think I would have seen it. But if there was any water running in the ditches there I didn't see it. I drove down there in 1885, mostly on the north side, but I don't recollect seeing any ditches at Garden City. I don't recollect seeing any either then or at any other time. In
3633 1887 we found very little water from the State line clear to Newton. We didn't go to Newton that year. We held our cattle at the Great Bend and sold them on the market the
3634 next year. I can't recall where we left the Arkansas river in order to go to Newton. We crossed Walnut creek, and there was a little water in it. We crossed it in 1871, I think,
3635 in August. As to crossing the Little Arkansas river, I don't recollect the names of those streams down there. It was a good while ago. I have seen the Arkansas river when it had water in it, though, in the State of Kansas. That was when I drove down with these cattle. A good many times there was a substantial amount of running water in the river. When I was down about the State line there was considerable; but when we got down the water ran in rivulets and stood in holes. There was a shower that would come every once in a while and there was a rain or two fell on
3636 us. I never saw the river dry at Pueblo. I always considered that when the water got down into that sandy country it evaporated. What didn't evaporate went into the sand and was lost.

As to some of those lakes up near Trinidad, my best recollection is that they have been dry there eight or ten years. I have not been down there, however, in the year 1904. I don't know whether they are now dry or not. I believe those lakes are still dry,
3637 from information, so that the wet season of 1904 didn't produce any water to stand long. These lakes were supplied originally from the foot hills of the mountains. There is no irrigation above them, and none below until you get down on the Purgatoire. As a rule, at their ordinary stage, these lakes have no outlet. In big storms, of course, there would be an outlet. The
3638 water would run off and go down the Purgatoire. What caused these lakes to go dry ten years ago I should think is because there is not so much snow and rain in the country. I have no information on that outside of my own judgment and because of my crops. I don't know of anything that would cause a change of snow fall in the mountains, and I am not posted on what the weather reports show as to that.

I have been on the Arkansas river through Kansas when there was high water in the river. I think that was in 1871. I might be mistaken as to the year, but the time of the year was in July. It lasted for a week or so, I think. I don't know when the high water began nor how long it lasted. It was a rainy season that year and

there were considerable rains along the river, I think suf-
3640 ficient to affect it. I don't know anything particularly about what they call the June rise, but we have rains along in the latter part of June that raise the water in the Arkansas river. I never noticed that the river might be up without local rains. I don't think there is snow enough in the mountains to make a flood or anything. After the snow melts of course it runs off gradually and when it ran off the river would be higher than when there was no snow melting.

3642 J. O. PACKER, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I am fifty-eight years of age, and reside at Trinidad, Colorado. I am a member of the bar, but have not been practicing for the last fifteen years. I have lived at Trinidad since 1873, and I guess I have seen the Arkansas river every year since 1870. I saw it in western Kansas and eastern Colorado in 1871, first at a point from Fort Dodge to Las Animas. I also saw it earlier in the season when we crossed it with a herd of cattle at Rocky Ford. We were driving a herd of cattle on this trip. We drove from Abilene. I didn't go with the herd all the way. I overtook it at Fort Dodge and then came with it up the river to the ranches, this side of Las Animas. I
3643 don't know the exact distance. I came from the railroad, across from Fort Hayes to Fort Dodge to join the herd, and from there I followed the river up to Las Animas. It was in the latter part of September or the first half of October. I remember that for two or three campings it was about dry. It was running a little in little streams maybe a foot or so wide, but you could walk across the narrow river bed without getting your feet wet; and we camped one night, I know, on the bank of the river, and the cook, to get water,—well, there was water running in small rivulets—
3644 dug a hole in the sand under the bank to get water for the camp. But the cattle scattered out and got what water they wanted. The reason he dug the holes was because the other holes were not deep enough to dip from. I think the water increased as we came toward the Colorado State line, because I didn't notice the river being dry that year except those two or three campings after I joined the herd. I think I joined it at a place called Cimarron crossing. I didn't see the river the next year at any point
3645 except Las Animas. There was a great deal of water in it then. This was early in the season. And we had to swim our cattle. I don't remember particularly the condition of the river in 1873. The only reason I remember it the other time, in 1871, is that George Lockwood, who owned the herd with me, said "It looks bad. It looks as though we couldn't water our cattle."

And of course I noticed and remembered that. But when we crossed the river at Las Animas the next year, I don't remember anything about it. There must have been plenty of water, and yet not enough water to make it bad crossing. I remember we forded it. There was no other way. But I don't remember the circumstance.

Cross-examination.

By Mr. ASHBAUGH:

3646 The last time we forded it was in 1872, I think about four miles below Las Animas. We were not bothered in crossing it, and we didn't have to swim the cattle, although I remember that we swam the cattle the first year in driving to Denver, at the crossing at Rocky Ford, in June. There was more water in 1872 when we crossed at Rocky Ford than in 1871 when we crossed at Los Animas. It was in September or October, 1871, that we found
3647 the river so low. I know nothing about how the water had been in the river prior to that time in that year. I don't remember noticing the river being dry only two or three times, at two or three campings. There was more water up the river than at Dodge. I think the water sank in the sand. The bed of the river down there was a great deal wider than it was above. We dug for water in the bed of the stream, not only to get water, but we could get better water. It was clearer. And the water we got in
3648 the holes we dug was cool. Even where there was no water on the surface there was water beneath. I think that by digging down anywhere in the bed we could get water very near the surface.

3649 CLINTON B. SHARP, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I am sixty-two years of age, and I guess Huerfano county would be my home. I have got a ranch down there, and I have been running back and forth, and I expect to go back in the spring, but just at present I am stopping at Denver, and my family is here. I have been a ranchman and stock raiser, and at one time I was water commissioner down in Huerfano county a while. That was
3650 about in 1887, and I worked off and on until 1891. When I first came to Colorado about twenty-six years ago I settled on the head of the Huerfano river and I lived there about ten or eleven years. My post office was Sharpdale. It is about two miles east of the Moscow pass, and that is in the Sangre de Christo range, some six or eight miles north of the head of the Huerfano, but the tributaries run right up there. When I left Sharpdale I located on the Cucharas, two miles below Walsenburg. That was in about 1885, and I have lived there ever since.

When I was water commissioner I had charge of the upper Cucharas, Bear creek, the Santa Clara and all the tributaries south
3651 of the Huerfano, and I had occasion during the earlier years I lived in Huerfano county to notice the snow fall on the head waters of the Huerfano and Cucharas river. At the head of the Huerfano, from where I lived, I could see a big body of snow the year around. I guess some of the snow was there that fell the first time, that was never known to go out. A big bed of snow and ice blocked right up on the north slope, right against the Sierra Blanco. That was in full view of my house. The Sierra Blanco is the highest mountain in Colorado. The Huerfano river at its head is located, I guess, fifty or sixty miles above the Cucharas river, and these two streams drain the country lying between.
3652 There is a divide between the two. In the earlier days there was a toll road on Moscow pass, and in that day and time we didn't feed any stock. I was running a stock ranch pretty much all the time. I was out on the range mighty near every day, and the snow then was deep on the range pretty much every winter. It would be packed in this toll road from twenty to thirty feet deep, and they would shovel it out, and when it got so bad they couldn't cross in wagons, they went over it. The mail went over it every day, and I was up on the range and around there every week riding all the time. But of late years we are not bothered with that snow at all. I think they have to shovel it but very little. Sometimes a small drift will come in the road and bother them, but the snow fall is not much there of late years. The snow was just over the slope, probably three hundred yards in length, where they used to shovel it. I am up there every year since 1900, but not in the winter very much. I go up sometimes in the fall and sometimes in the
3653 spring. The snow fall since 1900 has not been very bad right upon the Huerfano. I have a brother who furnishes beef for that camp at the head of the Huerfano. They have been running five or six years, and he made a trip once or twice a week, and told me the snow didn't bother him but very little in getting back and forth with beef since 1900. The snow during these later years was not as much as fifty per cent. of what it used to be. It used to be that you couldn't get up there on horseback or any other way only on snow shoes. Of late years the water doesn't get up there in June. The latter part of May and June is when the water or the bulk of the water comes down from the head of the Huerfano; and when I first came to the country in crossing it back and forth hand-
3654 ling stock it was a little dangerous to cross it in those months. I am referring to the head waters. That was some eight or ten miles right from the head of the stream, and of late years I don't think I ever saw it so that it would strike the horse's body at any time. The flow of water has not been as great.

In regard to the tributaries of the Huerfano and Cucharas rivers, they have dropped off in proportion. Some water would come down and would run out enough to irrigate forty acres of meadow.

We had a meadow right close to the place I lived on and we used to put up seventy tons of hay off that meadow. We irrigated it all from a dry gulch. There were a few springs up the gulch, but down next to the meadow it was a wet place and there were no running springs, gulches or anything for the water to run in. It just spread out. But we took out ditches all the way up and ran the water out on each side, and we let the water run there and made a good crop of hay. But for the last four years they haven't cut any hay there,
and there is no water. The stream has dried up. No water
3655 comes, I don't think, half a mile from the main range.
These ditches were just small ones. We would just run out a furrow or two. I know of little draws that come down on the south side of the Huerfano where the neighbors just went up and fenced in places for potatoes, barley patches, etc., five and six acres in a little field, and usually there would be water coming down enough there to irrigate them. They have hauled the poles away and abandoned those places entirely, on account of no water. I know of a good many lakes in that vicinity that formerly had water in them and that are now dry, but they are not fed from any stream. They are just natural lakes; no overflow to them. They are located between the Huerfano and the Chucharas. And when I first came
to this country, for ten or twelve years those lakes were pretty
3656 well filled all the time. I never saw them dry. But for the
last four or five years there has been about half of the time when I would come along there they would be perfectly dry. There is some eight or ten that I know of between the Huerfano and the Cucharas. A big rain would put a little water in them, but they would soon dry up if it didn't keep raining.

I have had experience in trying to get water down the Cucharas through the Huerfano into the Arkansas. We tried to get it to No. 1 ditch, down on the Doyle place. We shut down all the headgates and turned all the water in, and I think we kept the water
in the river fifteen days, and I think two feet of that got down
3657 to the Doyle ditch. I don't know the amount in the Huerfano.
In the Cucharas, at Cuchara, I measured it there every few days. I measured it first and then had a mark to go by. I think it was twenty-two or twenty-three cubic feet per second of time. I think this is about forty or fifty miles from the intake of the Doyle ditch; and all that water was lost between the point of measurement and the Doyle ditch, with the exception of about two cubic feet. In addition to this we had twenty-two cubic feet of water running in the Huerfano, and the two combined was not sufficient to supply more than two feet to the Doyle ditch. I think this effort extended over a period of fifteen days, and then we were ordered to turn the water loose and divide it up according to priorities, but the result was that we found we couldn't get the water down to the Doyle ditch and so we used it to supply the later priorities on the Cucharas river.

Cross-examination.

By Mr. ASHBAUGH:

3658 As to what became of this water, it just went right down in the sand and gravel. It had done that before. It was not an unusual thing for the water to go down into the sand there. I have seen it frequently since.

I think there is less snow in the mountains now than there used to be. I don't know what the cause of this is. I don't think it is caused by the timber having been cut off in any way, for there is no great amount of timber cut off, and

3659 not much change in that direction. I don't think there is as much down there as north. If there is not as much snow it will show in the river the next summer. I have been up there every fall and sometimes in the spring and sometimes during the winter, and I used to be there all the time during the winter, and the amount of snow fall made a deep impression upon my mind, and now I have been there only once in a while during the winter and have not noticed it particularly.

3661 WALTER N. HOUSER, Denver, Colorado.

Direct examination.

By Mr. DAWSON:

I am a civil engineer, also stock raiser and farmer. I live at Walsenburg, Huerfano county, Colorado, and have lived in Colorado for twenty-nine years.

3662 I saw the Arkansas river in eastern Colorado and western Kansas in 1877 first. I was engaged in rounding up cattle on the river that year, from Rocky Ford down to the State line, and along about the first of September on until the first of October. At that time there was very little water in the river. It was mostly confined to water holes. There were places where there was

3663 no running water. There was no uniformity in this regard. Sometimes possibly there might be some places as far as a mile, usually in places along under the heavy banks, and in places where the shale would come to the surface there would be a small stream of running water, and where it would strike sandy places it would sink. My recollection is that the water came to the surface right in below Rocky Ford there in a shale bed. It was a small stream. The greatest distance would be perhaps a mile between the holes, or about that. And it may be in going east from Rocky Ford there would be a couple of miles, and again it might not have been but half a mile, between these holes. I went east from Rocky Ford about to the State line, and the river there was very dry, and there were places where there was no running water. I think we stayed about a month on that trip before we got back. We watered our

stock from and camped along the river. I don't think that the water flow improved and during our trip.

3664 I was next on the river in eastern Colorado in September, 1878, and if anything the river was a little drier than in 1877. I think the description I gave as to 1871 would hold good as to this year. On this latter trip I was taking a bunch of horses to where Oklahoma is now, on Beaver creek, from Denver. I think we crossed the river right in below where Rocky Ford is now.

I have lived in Huerfano county nineteen years, and in Walsenburg about twelve years. I was deputy water commissioner in that district for about three years. My district covered the Huer-

3665 fano river and its tributaries in Huerfano county. I was deputy water commissioner, ten, eleven and twelve years ago, and my duties as such were distributing the water in the river among the consumers according to priorities. My district didn't take in all of the tributaries. In performing these duties I had an opportunity to observe the water conditions in that locality, and for the last three years the water was very scarce in that locality. I also had opportunity to observe the snow fall in the mountains on the head

3666 waters of the streams making up the Huerfano river during the time I lived in that vicinity, and for the past three or four years the snow fall has been exceedingly light. I don't believe there has been to exceed fifty per cent. of the amount there was there ten years ago. In the spring of the year when the thaw comes, on account of the less fall of snow, it has a tendency not to raise the stream as it did in former years, in fact we have had no high water in the spring for the last three years.

I have been engaged in the cattle and sheep business, and at the present time own quite a number of cattle, and my range is on top of the mountains in the summer, and of course in the fall of the year, up to the first of January, we are always rounding up our cattle and bringing them in to the ranches, and every year I visit

3667 the top of the mountains and the source of supply of the water of the tributaries of the Huerfano river, and I have noticed in several places that lakes are dry to-day where they were filled with water ten years ago. Especially is this true on the head waters of a branch of the Cucharas river. There are several lakes there where my cattle run which now are comparatively dry, except for a little time perhaps in the rainy seasons, but they dry up every summer, and formerly they had water the year round. We hardly ever name these lakes in the mountains. On the prairies the lakes generally have names, but in the mountains we don't call them by name. These lakes I am speaking of have not been drained or dried by any artificial means. They simply dry up by a lack of precipitation to furnish water to fill them.

In addition to this difference in the snow fall I have spoken

3668 of, there are other conditions which tend to allow the escape from melting snows and rainfall. For instance, the verdure is not nearly as great now as it was in former years, on account of the

fires. Saw mills have been cutting the timber. Cattle and sheep have been grazing in the mountains and consuming and destroying the undergrowth. At the present time you can ride over the mountains outside of the rocks most anywhere, and formerly it was very difficult to get through, from the underbrush, etc. In our present locality I should say the heavy timber has decreased at least fifty per cent. in the last ten or fifteen years. The smaller timber not so much so. The heavy timber generally was located on the north side of the hills, and our country being subject to heavy west winds, which drifted the snow over the mountains and deposited it in this heavy growth of timber, the shade there preserved it and it became very hard and icy in its formation, and it would last, where now the sun penetrates it, on account of those bodies of timber being thinned out, and it melts more rapidly than in the former years, and the tramping of the grass that formerly covered the country, and the destruction of the underbrush, has the same
3669 effect. The surface is open to the rays of the sun more and does not retain the moisture as it did in former years when the undergrowth was heavy and the ice would form in or become perfectly wet, and it would keep cooler and last longer than at the present time. When I first came to the country the grass was knee high, and now it is—well, it is very short now every year. We hardly ever have much grass in our country. It is confined strictly to gramma grass which formerly used to head out, but it seldom heads out now. The verdure is so thin that the sun dries up the ground so rapidly that the grass doesn't grow as it did in former years. And I think this also allows the rain to run off more rapidly than it did in former years, as is witnessed by the fact of the country getting cut up with arroyas and
3670 washouts, which go farther up the draws. I think in the last few years we have more rain in the summer than we used to have years ago, that is, more violent storms and less snow, and these rains cut up the country more than they did formerly when there was more grass on the ground.

My water district is No. 16 and comprises the Huerfano and its tributaries.

Cross-examination.

By Mr. ASHBAUGH:

When I was down on the Arkansas river in 1877 and 1878, if I crossed the State line at all I wasn't any distance in Kansas and know practically nothing about the flow of the river in Kansas, and my observation was confined to the two or three eastern counties of
3671 Colorado. There was running water usually right below Rocky Ford, while below that the sand was heavier. As to this water that disappeared, some parts of it were evaporated and other parts percolated through the sand in the stream, I expect. The bed of the stream is very sandy, and it absorbs the water. In

some places the bed of the stream is wider at the State line
3672 than it is at Rocky Ford. I think the river bed gets about a thousand or fifteen hundred feet wide between the banks in western Kansas, and in some places along about Rocky Ford and Las Animas I think it is a good deal wider.

As to my observations on the snow fall, that it is lighter in the last three years than it was prior to that, this is one of the disadvantages for the residents, I think, but I couldn't say that we are advertising it. I couldn't say that it is one of the facts of the
3673 case for the purpose of this trial. I think the snow fall was lighter for the last three years than for the three years immediately after 1890 and for the five years prior to 1890. The snow fall for the last five years has been a great deal lighter than it was the first five years I was down in that country. I don't remember that there was any complaint that the snow fall during the later years has been less than during the former years. This diminution in the fall of snow became perceptible about four years ago.
3674 Five years ago I can remember we had a great deal of snow. We had quite a heavy snow down there three days ago. It is the first we have had to amount to anything for three years. This diminution in the snow fall has been confined to about the last four years.

I think the loss of water in the lakes that I spoke of has been confined practically to the last three years and corresponds with the falling off in the snow fall, and I attribute it to that and to
3675 no other cause that I know of. These lakes first went dry about 1901. They formerly held water the year round down to that period.

The denuding of the forests began about ten or twelve years ago. This has been mostly confined to the Government land. The people generally just went in and cut the timber off. The heavy timber has also been destroyed by fires. The denuding extended back more than ten or twelve years, but has been more noticeable
3676 since about that time. I don't think the forest has any control over the amount of snow that falls, but I am satisfied that it controls the melting of the snows. It is a conceded fact out here that when the snow falls on the mountains in the timber it will melt later and more gradually than that portion which falls on the barren land where the sun can get at it or where an immediate rainfall would suddenly melt it. I don't think that the denuding of the sides of the mountains of the timber has had any appreciable effect upon the amount of snow that fell there, and it affects only the rapidity with which the snow melts in the spring. We
3677 have had no high water in the last three years in the spring of the year from melting snow. In June, 1904, we had considerable rain, which was an exception, and our streams were raised some with that. For a few days they were quite excessive. Some of the rains of 1904 were of the heaviest we have had for a

great many years. 1904 was not known as a wet year among
3678 us. These heavy rains cause some destruction of property.
I have kept no account of the rainfall and can't say how the comparative amount of snow fall and rainfall for the last four years compares with the four years succeeding 1890. Possibly the precipitation for the whole year might not have been much different for the whole year. Our rains are confined mostly to the lower valleys and the snows mostly to the mountains.

Examination by Mr. CAMPBELL:

The supply of water in the mountains no doubt would become less if the forests were cut down.
3679 Yes, to a certain extent successful irrigation in this country depends upon keeping up the forests, and where they are cut down they would have to be renewed.
I am familiar with the water shed of the Arkansas river. I have been educated as a civil engineer and know something about building reservoirs. There are a great many places in the water shed of the Arkansas river in Colorado where reservoirs could be erected to catch the flood and other waters which now escape. I think there are three in Huerfano county that would be practicable for building reservoirs. I never made any observation along that line at the head of the Arkansas river, only in our own
3680 county. There is water enough escapes during the spring and at other times of the year to fill such reservoirs if they were erected on the sites I have in mind. The waters thus stored would irrigate many thousands of acres. By "many thousands" I mean at least a couple or three thousand. You can successfully raise timber in the mountains without irrigation, but you cannot in the valleys.

Recross-examination.

By Mr. HAYT:

3681 I think that the climate in our part of the country has changed somewhat in the last few years. It seems to me we have more rain in the summer time and less snow in the winter than in former years, and I don't think it is as cold for as long a time as in the former years during the winter.

Redirect examination.

By Mr. DAWSON:

3682 I have had considerable experience with Medano creek. That runs in the Sand Hills country in the San Luis valley, and I have noticed the evaporation of water running in that kind of soil. I gave very close and particular attention to that stream because there was certain litigation that was in progress concerning

its waters. I took a ditch out of it for irrigating purposes, and I have observed that the evaporation is very rapid on account of its running across a sandy bed and through a dry country. I don't think I could illustrate this to prove my theory, because the water sinks vertically and also evaporates. What proportion I
3683 couldn't say, but I know that both are great. Where the water would run out thin over the sand and be exposed to the rays of the sun, as it is down on the Arkansas river in eastern Colorado and western Kansas, there is no doubt the evaporation is very extensive, but as to what percentage I couldn't say.

3684 CLAUDIUS V. S. HART, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I am fifty-three years of age, and my postoffice address is Apishipa, in Las Animas county. I have lived in this county since January first, 1881, and previous to that time I lived in Denver, from March, 1867 to January 1868.

I crossed the Arkansas river in 1868, but I first saw the river in western Kansas or eastern Colorado near the State line in 1875. I was gathering cattle—rounding them up—at that time, and that was about August or September, what we call the fall round-up. We probably were on the river two to four days. We were there at different parts of 1875, anywhere from just above Granada
3685 up as far as Pueblo. I was down there for two months, several times, and saw the river at different times, two or three days at a time, probably ten or fifteen or twenty miles apart where we would leave it until we came back there again, down the other stream. At that time, in 1875, there was very little water in it. Sufficient for stock purposes, though. In some places it would be running a little and in other places there would be standing water in pools. In some places there was no water at all between these pools, and in other parts of it they were connected by little streams, and in some places the bed was absolutely dry. I should say we would camp for a night or two, and the general course we worked our stock was up one stream and across over to the next,—up the Purgatoire and then down the Timpas creek. And that started in on the Arkansas river just a little above—west—from
3686 Granada, and from there up as far as Pueblo. There was more water as we came up farther on the river. I think there was more water running up about Rocky Ford than at any place I have observed.

I visited the Arkansas river again the next summer, in 1876. I was there every summer from 1875 to 1879, engaged in the same business. I am not positive about the river in 1876, but in 1877 it was very dry. I was down there in the May round-up. That was what we called the spring round-up. And then there was consider-

able water. But in the fall hunt, which commenced about the middle of August, and from that on, we found very little water and by "very little" I mean about the same as I have described in
3687 1875. There were places where there was absolutely no water at all. You could cross it. But my particular observation at this time was confined to probably half a mile or a mile of the stream, but at other times my observations extended thirty or forty miles up and down the river in the vicinity of Granada and up as far as Pueblo. In 1878 the conditions of the river were very similar to those of 1877 and 1875; that is, in the summer time. I was down there about the same time in 1878 and 1890 in former years, as our system of rounding up generally commenced about the same time or within a week or such a matter. The fall round-up commenced about the middle of August to the first of September, and we would generally get up home about the first of November.

3688 I am well acquainted with all of the headwaters of the Arkansas river from Pueblo south to the State line, especially with the Apache creek, a tributary of the Huerfano, and the Huerfano, Cucharas, Bear creek, the Santa Clara and the Purgatoire. The Apache is the first tributary to the Huerfano on the north side; the Cucharas is a tributary to the Huerfano; the Santa Clara empties into the Cucharas, and Bear creek does too; and in turn the Cucharas empties into the Huerfano and the Huerfano into the Arkansas.

I have had occasion to observe the snow fall during the years I have lived there about the head waters of these streams. I have had considerable work from 1881 up to about 1885. I was in the timber business, working for parties getting out ties and
3689 lumber. We were doing this work all the year round, but there were more engaged in it in the winter time. The timber was taken out on the head waters of the Santa Clara creek, on the Apishipa and on the hills between the Apishipa and a place called Cañon del Agua, six miles south of the Apishipa, and while cutting this timber and looking after my stock I was frequently up in the mountains during these years, and since 1885 I have been up there frequently in the stock business but have not been engaged in the timber business. I have neighbors up there and have
3690 bought stock a good deal from them. I have been up in the mountains several times since 1900. My home is located about twenty miles from the peak and about two miles from what we call the foot hills. Since 1898 or 1899 I don't think there has been fifty per cent. of the snow fall up in that country that there was previous to that, and we don't have as much water in the streams on that account. There are a few lakes scattered around over the prairie, one ten miles east of me called the Widderfield lake. The lakes are named that way because they are close to the ranches of parties by those names so that we know just what ones we are talking about. There is another lake called the McEnnery. It is in township 30–64. There are also other little lakes around

there, but I don't know their names, and they formerly had
3691 much more water in them than they have in the last few years, as in the latter time they are very dry with us. Five years ago—that was in 1900—there was more water running down the Apishipa than I ever saw since I have lived there, in the spring. It was caused from the early rains. It rained almost continually. Oh yes, I have seen these lakes go entirely dry, and in these last five or six years the complaint has been general from the men living on these lakes that irrigate the land as to the scarcity of water. They don't get enough. I personally having an interest in three ditches, we don't get half the water we used to.

In regard to the timber at the head waters of the Santa Clara and those other streams in that vicinity, including the Apishipa, I should judge that in the next ten years at the present rate that has been going on since 1876, there will not be a stick large
3692 enough there to make a whip-stock. They are cutting this timber every day, everything that is four inches in diameter and from four to eight or ten feet long. It is cut and hauled and sold to the mines for mine ties and mine props, and that which is large enough is cut into railroad ties. They are shipped to different mines. They used them at the Victor Fuel Company, the Colorado Fuel & Iron Company, the *the* Hastings, the Berwyn and the Tobasco, and there are a great many coming into Cañon del Agua. These are coal mines, and some of them are very extensively worked. I heard they had on pay-roll at the Hastings at Cañon del Agua something like a thousand men. These mines are located pretty close to the base of the mountains and near the timber that
3693 is cut off. If a man saw the country previous to 1880 and would see it now he would hardly recognize it as the same country, except from the mountains. So far as the timber is concerned there is no comparison. There is considerable small pine now that I have noticed along there. I don't think there is anybody living now that will be alive when they are big enough to be used, they grow so slowly. They use this small timber for mine ties and possibly for fire wood.

Cross-examination.

By Mr. ASHBAUGH:

3694 I don't think I went down the Arkansas river in 1876 when our camp wagon went down. There was one time in 1877, 1878 or 1879 along the river that there had been a rain in the mountains and there was a flood and it was bank full. I think that must have been in the spring round-up of 1877. There was usually more water in May, June and July than there was in September and October. In April, May and June is when the stream receives more water from the mountains, and rains, than at any other time except what we call rain storms or floods, and these

periods of high water vary according to the amount of snow
3695 in the mountains. Those times that I saw the river very low were during the dry season of the year. I never saw the time when there was not any visible water, only in places, parts of it, and although evaporation had gone on so rapidly, I attribute that to a kind of underflow, or the water sinks in the sand and gravel down to a very hard foundation. When the water strikes that it will come to the surface. I was not down across the
3696 Kansas line nor beyond Granada at that time. There has not been half the snow fall since 1900 that there was for the four years succeeding 1890. The snow fall for the four years succeeding 1890 would not compare with the snow fall for the four years succeeding 1880. In October, 1880, I was at the Spanish peaks when the snow fell there about three feet deep. 1890, as I recollect, was about what we call an average winter, but less than 1880. The decrease in the snow fall that has been noticeable has been since 1898 to 1899, to be positive about it, and these lakes that I spoke of, have gone dry since 1898 and 1899, but prior to that time they had water in them.

3697 As to the denuding of the forests, when the trees were there it is more noticeable that it retained the snow there longer so that it melted slower and let the water run longer, and we got the benefit of it. In other words, it holds it there until the warm rains melt it. It would be the observation of farmers and stock men that in those portions of the mountains where the timber has not been cut off it might not increase the amount of snow fall but holds the time of its melting back so that it melts later and more gradually. The timber retains the snow longer.

Examination by Mr. CAMPBELL:

3698 The timber I spoke of that was being cut in the mountains was cut on the tributaries and hills in these localities I spoke of east of the Spanish peaks. This cutting of the timber has been going on ever since the Denver & Rio Grande railroad was built in 1876. They are cutting timber there less than eight inches in diameter for the last seven or eight years. The Colorado Fuel & Iron Companp own some of the mines that use the timber that is cut, and for these mining purposes they are cutting timber at
3699 four inches. The land from which this cutting is being done has not been proven to be mineral land. They generally prove it as mineral land if they cut timber on it. They are now cutting timber right along there, and for props for mines. Some of the props are three or four feet long and some are seven or eight feet long. They use them to hold up the roof where they are digging coal. They are cutting these props every day.

3700 JESSE F. McDONALD, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I am forty-seven years of age and reside at Leadville, Colorado, and am engaged in the mining business. I was a civil and mining engineer, and followed that business up to 1889. I have lived in Leadville for twenty-six years. Since that time I have been mining. I am at present lieutenant governor of the State of Colorado. In pursuing my profession I was over the drainage area near the head waters of the Arkansas river a great deal, principally in the vicinity of Leadville, which is right at the head waters of the Arkansas river, and in fact all through the mountain sections within a
radius of twenty or thirty miles in every direction from Lead-
3701 ville. Leadville is situated about ten miles from the very
head of the Arkansas river. The latter has three main branches right in the vicinity of Leadville—the main stream, the Tennessee fork, and the Lake fork—and a good many other streams. These streams rise from ten to twelve miles from Leadville in the main range of the Rocky mountains.

I have noticed the snow fall in this vicinity for the last twenty-five years, and the snow fall for the last five years, since 1900, has
been very much less than for the five years immediately pre-
3702 ceding the winter of 1900–1901. The decrease is very much
over one-half. The snow fall for the last five years has been but little if any over half of what it was for the first twenty years I was there. When I first located there in 1879 the mountains were very well timbered, but it has been almost entirely cut off since that time for lumber and mining purposes, in fact there is no timber left in that vicinity except some very small timber that has grown up within the last few years and that is too small to be of any value. And in addition, there has been quite a large amount of this timber destroyed by fires, and these fires are attributable to several causes. Sometimes they are from camps and sometimes from locomotives. Of course the timber being cut has left underbrush and left the tops and refuse, and this makes it very bad for fires. They would spread and sometimes cover a good many miles of country.

Cross-examination.

By Mr. ASHBAUGH:

3703 I base my judgment as to the decrease in the snow fall
upon one thing—that I have been living right there and have noticed it, and have always kept a dairy, which runs back eighteen or twenty years. I don't say exactly that my diary shows the snow fall falling off fifty per cent in the last four years. I should say that the snow fall has been but little more than half. The year

1900 or the year before that, 1899, was approximately the turning point. I don't know whether my diary corresponds with the
3704 general weather reports in this State or not. I have never examined them, and have no information from the weather reports whatever. If the weather report- showed there had been no falling off in the snow fall, it would still be my opinion that there has been such falling off, regardless of such reports. My observations have extended principally in the vicinity of Leadville, twenty or thirty miles each way. My knowledge has not been so very intimate as to the snow fall for thirty miles in each direction from Leadville. My
3705 home was there, and I have been mining a good deal. I don't know how to account for this falling off in the snow fall since the years 1899. I simply know that there has been less snow fall. The denuding of the forests may have had something to do with it. I don't know. That is largely theory, perhaps. It is the general opinion that the denuding of the forests has had an effect upon the snow fall, but I don't know. As I said, that is
3706 largely theory. The snow fall for the five years succeeding 1899 would be a little more than half when compared with the snow fall during the five years succeeding 1890. The snow fall for the five years succeeding 1889 has been less than the snow fall for the five years prior to 1890 and probably about the same as compared with the five years succeeding 1890. There was no particular change in the amount of snow fall from 1885 to 1895 that I remember of. From 1879 and for several years after that we had quite heavy snow falls, and it has been less since then, and particularly during the last five years. I know that during the winter of 1879 and for several succeeding years we had quite heavy snow
3707 falls. This may possibly have lasted for ten years. The amount of snow fall for the five years since 1900 is about one-half of the snow fall during the '80's. I didn't say that the denuding of the forests had anything to do with the snow fall. I simply said I didn't offer any opinion. The denuding of the forests has some effect as to the time and rapidity with which the snow melts and runs off. Snow does melt more quickly in the sunshine than in the shade of a tree. The elevation of Leadville is about 10,000 feet. The denuding of the forests began in the summer of 1879. There have been teamsters employed hauling the mining timber into Leadville up to within the last two or three
3708 years. This denuding of the forests extends back perhaps from fifteen to thirty miles. The timber is pretty well cleared off now within thirty miles of Leadville; that is, all the timber that is accessible. The fires have interfered in a great many instances. I couldn't say as to exactly what years. There have not been very many within the last two or three years, because it is pretty thoroughly burned off.

Examination by Mr. CAMPBELL:

They have been cutting timber up there of less than eight inches in diameter. There is scarcely any left of that size. They have cut about all there is. A great deal of the timber that was cut there in the early days was burned for charcoal.

3710 DANIEL L. TAYLOR, Denver, Colorado.

Direct examination.

By Mr. ROGERS:

I live at Trinidad, Las Animas county, Colorado, and have lived there permanently since 1865, and a part of the summer of 1862. I have been county judge; I was in the territorial legislature once; I was in the State senate in 1876 once, and I have been county treasurer at two different times.

I am somewhat familiar with the Arkansas river in western Kansas and eastern Colorado. I travelled up that country
3711 in 1859, striking it at what we used to call Great Bend. I was footing it pretty nearly all the way. I had a mule and a cart. I was coming to the Pike's Peak gold fields. And after striking the river we were all the way on the river. It must have been near the 20th of April when we struck the river, and the reason I remember the time so well, it was the day I was twenty-one years old. I should say it took me about fifteen days to get to Great Bend. We left the river at Pueblo. We travelled, I think, possibly twenty or twenty-five miles a day between Great Bend and there, and so it might have been along the first of May when we got to Pueblo.

3712 In travelling along the river I remember one particular circumstance, and that is about all I can remember about it. Coming up the river at what I think was Bent's new fort, about where Fort Lyon is now, it might have been a little before we got there, some one remarked "Across the river, that is New Mexico." And I said "What river? I don't see any river." Well, they said the river was dry now, but right across there it was New Mexico. I remember that and then I remember once or twice where we camped below, I can't say how far, the river was very low. There were no towns or anything that I could identify the places where we stopped. I didn't see anything for seventy-five miles this side of Leavenworth. That is about the only town there was on the river. We struck the old Santa Fe trail up there in Kansas somewhere.

I was next on the river in 1862. I came from Fort
3713 Leavenworth up as far as Bent's old fort. In 1862 we struck it again at the same place, at what we called the Big Bend, and I think this was along about the last of July. I was coming out with some wagons that belonged to Irvin & Jackman. They

had the Government contract for freighting across the plains to New Mexico. We would travel possibly fifteen to twenty miles a day, and would camp at noon. This was about the way we travelled in 1859. There were some places along the river where it was very low. By that I mean there were places where it hardly ran. You could just see a little stream. I think we were possibly twenty days coming up the river at that time. If I remember rightly,
2714 when we got farther up there was a little more water, and I do remember that we had some very hard rains after we struck Fort Lyon. It rained all the way across into Fort Union, New Mexico. I remember these rains very well because I had to stand guard over the cattle every third night. In the spring of 1863 I went down the river again. I think I struck it possibly in the latter part of April at Bent's old fort and went on down. Maybe we travelled along three hundred and fifty miles. I don't remember much about the river when going down, but I do when we came back. I noticed in one or two places at that time the river was very low. We crossed it at what was called the Cimarron crossing, and that is as far as I came up the river that year, and it was low there then. I know the boys in there pulled their boots off. And when the river was up whenever we would cross it they would always pull off their boots, roll up their pants and drive their teams across, but that year, at that time, I noticed they didn't pull off their boots. How low it was I couldn't say, but I know it was low. In 1865 I was again on the river. We struck it at Bent's old fort. That was going down, and as near as I can remember it must have been along about the last of April or first of May. It must have been about the 20th, as that is where we first heard of the assassination of President Lincoln, right there at Bent's old fort, and there the river was
3716 very low. We came back in July. I spent the Fourth around Kansas City. And there was one place I remember distinctly, that was below the Kansas line, the river was nearly dry, but I don't remember as to the general condition of dryness coming along the river then. On the return trip in 1865 Senator Elkins was with us. He had been down to Missouri and was married and was coming out and bringing his wife. He had located in Santa Fe, and the way we came to be together, the Indians were so bad that year that we had to travel from one fort to another and we had an escort and we had to travel slowly with the trains.

I went down the river again with my wagons in 1866, and came back on the stage coach, and I remember one incident well
3717 on that trip. We went out to kill some buffaloes one morning, on the trip going down. I was with my wagon and there were three of us on horse-back. I had a man with me who had a horse, and there was another man there with us. He had a horse. I think this happened below Pawnee Rock. We started across the river to kill some buffaloes very early in the morning, and where we crossed the river it was just a stream of water running very shallow. It was not over three or four feet wide, I should say. We got

across the river on the hill, and the sun was just coming up. We saw a body of men and we could see something glistening in the sun, and of course thought it was Indians and that that was their guns. We started back as hard as we could go, and we didn't go to the place that we crossed; we struck for a train; we could see the train; and we ran into a bank; well, it wasn't so high but what we could jump our horses down. We didn't feel like looking for any good place to cross and we jumped into a little hole of water—that is, a hole of water, I don't say a little hole—and if I remember rightly now, it was a hole of water that had settled up against the bank, and if there was any running water there I surely did not see it. I might not have been looking for running water about that time. That was below Pawnee fork.

3718 I think I saw the river again about 1867 or 1868, possibly. I used to strike it above La Junta. I used to drive some cattle I was raising to Denver, and this generally would be in the spring, and then I would travel up the river until I got nearly to Pueblo and then strike across to Denver. Now, that continued from 1867 each year up to 1873. I did that every spring. I have observed that the Arkansas river has a pretty good flow near the mountains and a lessened flow as it gets away from the mountains. I will state one thing more that I just happened to think of: From 1875 to 1882 I was on the Arkansas river a great deal between Dodge City and Las Animas, handling cattle over that country. I had my ranch south of the river and oftentimes our cattle would scatter and I would be on the river. And then when I drove my cattle to market I would drive them to Las Animas, and sometimes I would strike the river farther below Las Animas and drive

3719 to Dodge. I did that for years. I have seen the river dry as it gets along toward the line between Colorado and Kansas. That is one of its characteristics. Of course there are times when it is full. But I have seen it dry often. Now, if you would ask me how many times, I don't know that I could tell, but I have seen it dry along the river there so that when you would drive your cattle into the river they would run from one hole to another to get water. We would drive to Dodge, gathering our cattle pretty early, say in August, and usually drove in the fall, but sometimes we would drive in the spring, possibly in June and July.

3720 I now live on what is called the Purgatoire, and I am quite familiar with the drainage of the Purgatoire river so as to determine whether or not there has been any lessening in the amount of run-off, and I have noticed at times—well, I know that the water used to run more in the early days than it does now. I don't know that I could say when it did begin to lessen, but it has been more marked in recent years. I don't know whether I could state positively in regard to the lakes or ponds having dried up. There are no lakes or ponds along on the Purgatoire in our section; I have noticed this out on the prairie down in east of Trinidad. There is where I had my ranch for a good many

years. I noticed when I first went down there there was more water in the lakes and ponds than in after years, but right around Trinidad I don't know that we have any of them; and I couldn't say that I have noticed any change in the mountain snow fall, because I don't hardly ever go to the mountains. I live about forty miles from the range.

Cross-examination.

By Mr. ASHBAUGH:

I came up the Arkansas river in 1859 and went down the Platte river that same year, striking the Arkansas river at Great
3721 Bend. There was one place it was dry, and there were plenty of places where it had water in it. I think we had plenty of water for our stock and cooking purposes all the way up. We did have; I know that. There was running water in it. It is pretty hard to say how deep; possibly something like a foot.

I don't remember how the water was in the Platte river in 1859 when I went down. I think when I went down the Platte we had plenty of water in the Platte and I wouldn't notice it.

In 1863 we crossed the river at Cimarron crossing, when
3722 the men didn't need to take their boots off. At other times they might there at the crossing have had to take their boots off and roll up their pants, as they usually did. Oh yes, I have crossed the river when the water would have gone over the boot-tops. I crossed it at Bent's old fort when it would be over the boot-tops. I had no occasion to cross it down in Kansas when I was with the train. At Cimarron crossing is the only place I crossed the river in Kansas with the train. At other times and places there
3723 was considerable flowing water in it. April is not the month when there is the most flowing water in the river. The spring rains have not begun to fall and the snow has not then begun to melt in the mountains. The water usually begins to rise about May or June, and then for a month or two there is more water than in April, and after the rains for the summer are practically over and the snow is melted in the mountains the river goes down again somewhat. The height of the river at these seasons depends upon the amount of snow in the mountains the winter before and the amount of rain during that summer. I couldn't tell you
3724 how it is that there is less water in the river in Kansas than in Colorado at the same time, unless it is that it went into sand. The conditions are such that the water would go into the sand, and that condition extends out under the banks and back from the river. I don't remember of ever digging down in the river bed to get water.

I think the flow in some of the streams has lessened in later years, and I particularly refer to the Purgatoire. I am not familiar with other streams.

3726 JOSEPH K. KINCAID, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I am fifty-two years of age, and reside in La Veta, Huerfano county, Colorado, and am engaged as a merchant and in farming and stock raising. I am located about twelve miles from the summit of a portion of the mountains, say Abeyta mountain, where the road crosses. I came to Huerfano county in 1874 and located between where La Veta is now and Walsenburg and about five or six miles from where I am now located. At that time I was kind
3727 of tramping around. I located there and went farming and trading. The first year I farmed, I believe, some, and the next year I freighted some. I believe it was from Pueblo across the valley into New Mexico. I have a stock ranch at the present time near the summit of the mountains above La Veta, on what is known as the Abeyta. This is a tributary of the Cucharas. I have been in the cattle business more or less since 1874 or 1875. Perhaps in the latter year I owned the first cattle. And my cattle range has been largely in Huerfano county, extending around on the various tributaries—the Santa Clara, Bear creek, the Wahatoya, the North Abeyta, South Abeyta, Middle creek and Oak creek. Those are little tributaries of the Cucharas. My business did not cause me to go frequently to the head waters of the Arkansas river but occasionally.

I have been on the head waters of the Huerfano. I have spent considerable time and have gone very often to the different localities of which I have spoken. I was riding after cattle a considerable part of my time, looking after them at the ranges and at the
3728 water holes of those various little streams. The matter of running water and standing water for stock was a matter of interest to me. It is a matter that every stockman in this country pays more or less attention to.

In referring to my freighting between Pueblo and New Mexico in 1874, I mean by "across the range" across this Abeyta mountain into the valley of the Del Norte, Saguache and Conejos and as far as Tierra Amarilla in New Mexico. We went over the Abeyta pass; that is, the Abeyta creek, one of the tributaries of the Cucharas.

The snow in those earlier days in the mountains during the winter and spring months was pretty bad, very bad in the spring. It was pretty deep. I don't know how many feet, though. Of course we would cross over it lots of times and go on top of it. It
3729 would get hard. It would be very deep in places. There were times when we really couldn't cross it. The Denver & Rio Grande railroad crossed the La Veta pass in 1877, and it runs through my ranch below La Veta, and I have known times when

they were unable to operate there over the mountains by reason of heavy snow fall. I know when they couldn't even pass through my ranch between Walsenburg and La Veta for perhaps a week or ten days. The snow would be deep during those times. There was a little cut there and it would be eight or ten feet deep drifted in, and on a level perhaps eighteen inches to two feet. In the last few years this snow has been a great deal less, according to my observation. I don't think it has been any more than half—hardly half—since the winter of 1901. This applies to the head waters of these various little tributaries of the Cucharas river. The
3730 lack of snow fall has caused the water supply to be very short. There are quite a number of little lakes that of late years have been short of water—have gone dry—and those little streams, Indian creek and the Abeytas and the Wahatoya, have been dry. The fact is that in some of those years they have not run water down at any time of the year. They rise in the foot hills of the mountains, the Spanish peaks, and the various ranges. They spread out like your hand, entering into the Cucharas within fifteen or twenty miles from La Veta, and my observation is that there has
3731 been very little water. I think there was more water in the earlier periods. They ran a good deal of the time earlier in the fall during the '70's and early '80's. They ran in the spring, but later in the fall they would probably go dry or at least it would be in holes. And since 1900 in some of those years they have never even run at all, that is, not even running into the Cucharas. They were entirely dry. The water supply of the Cucharas of late years, since 1900, has not been nearly as much, according to my judgment. I don't believe there has been much over one-half as much water. For several years there has been no rise at all in the spring. It never got muddy nor milky last year nor the year before. I lived right on it. In the earlier years there was a heap of water. A great many years it was out of the banks and overflowed.

3732 There has not been as much timber by a good deal on the head waters of these streams now as there was in the earlier years. Before any was cut there was a good deal of timber there. None had been used at all when I first went there. It has not all been cut off now, but a good deal of it, in the lower foot hills particularly. There have been some fires in the mountains that have destroyed a good deal of it as well, and I think the cattle and sheep have eaten and destroyed a good deal of the underbrush and small timber, especially the sheep.

Cross-examination.

By Mr. ASHBAUGH:

3733 The snow fall in the years 1901, 1902, 1903 and 1904 has been very much less than in prior years. The snow fall for these four years would be just about one-half of what it was for the years succeeding 1890, and also about one-half of the snow

fall for the four years prior to 1890. The snow fall was fairly uniform until about 1900 or within a year or so of what, and after 1900 it has apparently been less for the four years.

There has been a good deal of timber cut off and burned off. I hardly know how much, but I should guess it would be something like one-fourth or one-fifth or something like that, taking the
3734 whole range into consideration. I think the cutting off of the timber has had something to do only with the melting and running off of the snow and water. I hardly think the cutting of the timber would have anything to do with the amount of snow which would originally fall each winter, but affects only the time at which it would melt in the spring and run off. Because of the sunlight and the wind and the rain, the snow melts more quickly and earlier and runs off more rapidly in those parts of the range where the timber has been cut off than in those parts where the timber is standing.

3735 S. J. CAPPS, Denver, Colorado.

Direct examination.

By Mr. HAYT:

I have resided in Huerfano county, Colorado, thirty-two years last New Year day, and have lived there continuously since then. My ranch is about seven or eight miles from the foot of the east peak of the Spanish peaks. I have lived on two or three different ranches on the same stream, but always on that stream. In 1881 and 1882 I lived within a mile of the foot of the peak.

I was on the Arkansas river in the fall of 1870. I was holding a herd of beef cattle for Mr. Reef over on the Kansas Pacific, and a bunch of them got away and drifted over to the Arkansas river before we could catch them, and it took us nearly two months be-
fore we got them all back. During those two months I was
3736 on the river from about fifteen or twenty miles above Fort Lyon to thirty or forty or even fifty miles below it, and my recollection is that there was no running water in it at that time. There were holes of water sometimes extending quite a distance, and then again there would be quite a distance where there would be no water. A chain of pools sometimes would extend quite a little piece, and then again there would be a dry place where there was a sand bar and the water there sank and came out farther down. But often we travelled quite a distance, for a mile or two, without any water. That is my recollection. Of course I didn't pay much attention to that, only I know we had places where there was no water. I can still remember seeing it in that way.

I didn't come back to the Arkansas river again only as I crossed
it at Pueblo until the fall round-up of 1877. I went down
3737 there on a beef round up in that fall. I think that was along about the first of September, and it took us twenty-five or

thirty days to work the Arkansas river out, or nearly a month. I shouldn't think there was much difference in the amount of water in the river in 1877 from what there was in 1870. There was still some water there, but not a continuous stream. There were stretches where the river bed was entirely dry. We went to Las Animas and up nearly to Rocky Ford that year. There was a little more water up that way than there was down east. I again went back the second year after that on the round-up in 1879. That was the fall round-up. I think I joined the round-up in 1879 about a day's travel above Las Animas, and I didn't go to Las Animas that year, if I remember right. I worked back up to Rocky
3738 Ford. I didn't go up into Pueblo again. We were down there about the same length of time, and my recollection is now that there was even less water there then than there had been the other years. I know we couldn't hold a big day herd of cattle that year at all. A day herd were the cattle that we rounded-up and cut out, too old to take home, and the reason we couldn't hold such a herd there was because there wasn't water enough to keep a a big herd of cattle together. When you turn a big herd of cattle onto a watering place lots of them would not get into it at all. And we had a good deal of trouble with the horse herd too. It would be necessary for us to string out these herds. That is my recollection. We had no difficulty in getting water for camping purposes. The mess wagons would go ahead and keep the stock off from where we made our camps, so I think there was always sufficient
3739 for that.

When I first located on Santa Clara creek my ranch was about three miles above and about half way between where I live now and where I lived in 1880, and at that time that stream ran nearly all the year. There were quite a number of good springs on it. There were only two ditches out of that creek when I first went there, but they had plenty of water, and in 1874 I helped to take out a ditch on this place that I located there and we had more water than all the ditches could use for several years. There was a year or two as we went along when the ditches were all short. For instance, in 1880 we had no irrigating water to speak of, and then in 1883 we had little or no irrigating water. Up until 1899, from then we had good seasons, but 1899 was again a very short year.
3740 Then the spring of 1900 was a good spring. We had lots of snow, but it didn't come until late in the spring. It didn't last long in the ditches, but it still gave us enough to soak our alfalfa and meadows up. But from that time we have had very little irrigating water. Two years, 1902 and 1903, the water from the snow that melted in the Spanish peaks never went below my ranch. It never ran below my ranch during those two seasons. That was very unusual, indeed. It had never happened before since I have had the ditches. During the years I have lived there in the stock growing business I have not been much on the Cucharas. My stock only ran from Bear creek on the west or northwest to the

Apishipa on the other side. Bear creek is the first one going south, then the Story creek, a branch of the Santa Clara. There is the branch that Walter Arnold lives on. We call that *that* Arnold creek, and mine is called the Capps creek, and then there is the Spring cañon. There is no irrigation on that, but there are a number of good springs and when there is plenty of snow some water runs down there, but there are no irrigable ranches on that stream. The next one is the Mauveritis cañon. That is a
3741 branch that runs into the Apishipa about four miles above Del Agua. And the next is the Trujillo creek. They make their rise up in the mountains, Bear creek being as high as timber line on the east peak. It flows into the Cucharas just below Walsenburg and is about twenty-five or thirty miles long. Bear creek takes its rise about four miles from the foot of the mountain. That is on the northeast side of the Spanish peak.

3742 I have often crossed the Apishipa, although I have not been much at the head of it at Del Agua, and of late years I have often crossed when it was dry, since 1900, when it was completely dry. There have been some more rains in the last few years during the summer than we formerly had, but still there hasn't been to exceed fifty to seventy-five per cent. of a full crop in this vicinity since 1900. During the earlier years, in 1883 there was over three hundred tons of hay cut from the Cañon ranch, and in the last few years I have done the baling of the hay on that ranch and there hasn't been over seventy-five tons of hay cut on the whole ranch during the whole of the years since 1900, and last year
3743 there was not a mowing machine run on the ranch. By seventy-five tons I mean for the entire period since 1900.

A number of wells in this vicinity have gone dry. I sank a well myself in 1884 where I am now living and for about sixteen or seventeen years there was no better well in Huerfano county. We had plenty of water for the house and for irrigating a little garden spot and for watering our horses, which we did there a great deal, but in 1900 it began to go dry and I took the rod out of it and sank it down to solid rock so that we couldn't go any farther without drilling. But it kept on going dry until the past two years we have had to leave it entirely and go farther down, at least a hundred yards from the house, and sink for water right close to the bed of the creek, and we have never used that well since. And a neighbor of mine had a well that was sunk before mine was. He lives about two miles from me on the next branch of the Santa Clara, and for years they couldn't get the water out of their well to clean it out. A few years ago it commenced to go dry and they were getting less water so that the pump or bucket would rile the water and they finally couldn't get enough so that they had to go farther away from the house and sink, and their well is now in the same condition as mine.

3744 Those are the only two wells I am familiar with. But on Bear creek, on the McAllister ranch, they have cut as high as three hundred tons of hay and alfalfa on that ranch, and in the past

few years it has not gone over one hundred to one hundred and twenty-five tons, and it is called one of the best ranches in Huerfano county, and they have the first water right on that stream.

When I lived up at the base of the Spanish peaks I could count thirty-nine lakes in sight of my house during 1880 and 1881. My wife and I and the visitors and neighbors have counted them repeatedly. Now there is only one with any water in it and that is a reservoir that I have built since that time. A few years ago the other thirty-eight have all gone dry. There has been some water in them since 1900 when there was a heavy rain. But the time I speak of, years ago, they would hold the water and it would stay there for months at a time without any more seeming to come to them, but now they will fill up but it dries or evaporates or seeps out in a very short time, showing that the ground—that is my theory of it—is very much drier beneath than it used to be, so that the water seeps away a great deal faster.

3745 There has been a great deal of timber cut off the Spanish peaks. There was some very nice timber there when I first went there, and the undergrowth was very thick under the trees. That was the general condition from the foot of the mountains up, and then down in the foot hills there was a great deal of cedar and pinon and spots of pine. And the Four-mile country, we call it, that is out in the foot hills about ten miles from the peak, there was a fine body of timber there, but that is nearly all gone now. Practically, I might say it is all gone that is fit to use.

3746 In that part of the country there have been saw mills, and then it has been used up for mining purposes. Of course it has been taken out for local improvements on the ranches, but that is only a very small part of what is taken. Then these big pine trees are used for what are called caps in the mines. They are sawed, I think. They are sixteen inches long, and then they are split about six inches wide and about two inches thick and they are put on top of the props. I am speaking of coal mines for which this timber is cut. And in cutting this timber they are always leaving the tops of the trees. Of course that makes the fire that much fiercer. The fire kills all the trees where it goes and it is impossible to put it out. I think about five or six years ago this coming spring

3747 the fire broke out right at the stream I live on and burned from four to six hundred acres of timber. And that was high enough up so that there hadn't been much of that used at that time. That is the only fire we have had for a number of years. I am not positive whether that was five or six years ago. Yes, we had fires before that, but not so bad. They were caused by hunters and sheep herders and sometimes by the saw mill men.

Cross-examination.

By Mr. ASHBAUGH:

During the year 1870 my observations on the Arkansas river were confined to about forty miles on each side of Fort Lyon.
3748 I didn't go down as far as to the Kansas line, so I know nothing about the flow of the river through Kansas. The eastern portion of the territory that I observed was drier than the western portion. I suppose it was farther from the source of supply and gradually decreased as it went down. Some of the water evaporated and some sank into the sand. It gradually got less as it went down from the source of supply—from the mountains. The water that we observed in the lower holes must have been supplied from
3749 beneath the surface. These observations were made from September on. I don't remember of ever being on the river in the spring season of the year.

As to the supply of water in the streams near my ranch prior to the last three or four years, it was very good, with the exception of the year 1880. I raised what we call a full crop every year from 1880 to 1893, and during those years my water supply was good. With the exception of 1893, up to 1899 it was good again. We had another stretch there of several years that were very good. We raised full crops. With the exception of the years 1880 and
3750 1893 my water supply was good from 1880 to 1900. I think I counted the thirty-nine lakes near my home the first time in the fall of 1880. From 1881 down to 1893 we could still count those thirty-nine lakes with water in them. Sometimes there would be that many and sometimes a few less, but approximately
3751 that many. But on an average we could see the whole of those thirty-nine lakes during that time, and with the exception of the year 1893 that continued down to 1899. After 1899 the number that we could see with the usual amount of water in them began to decrease. It decreased in the year 1900 and has been decreasing since that year. During the year 1900 until late in the fall I don't think there was a lake in sight from that ridge I spoke of that had water in it. The heavy rains of 1904 did not fill these lakes. It was not a rush of rain in our neighborhood. There was a good deal of water fell, but it didn't run off the surface.

I dug my well in 1884, and for sixteen years—that would
3752 be down to 1900—there was plenty of water in it. This was the same condition in other wells that we dug when there. There didn't seem to be any general decrease of water down to the year 1899, with the exception of the year 1893. If there had been any perceptible falling off of water I think it would have shown in that and other wells. Since 1901 this well and other wells have been practically dry. So that the perceptible falling off in the water began perhaps in the year 1900 and was very marked in 1901 and continued through 1902, 1903 and 1904. Since 1901 there has

been no water in that well, but prior to 1900 there was always water in it.

I believe, myself, that the cutting of the timber affects the amount of snow that falls in the winter. I believe the timber has a good deal to do with the precipitation. I wish you to understand, however, that I couldn't even tell why this might be true. The cutting
3753 of this timber has been going on for eight or ten years, but not enough was cut off down to 1900 so that it seemed to make a difference in the amount. I think the scarcity of timber about 1900 had reached such a point as to affect the amount of snow fall, but it certainly had not affected it prior to 1899. After the timber is cut off there are some young pines growing up, but
3754 over this burned space I speak of I don't think there has any started up at all yet. I think this fire that I spoke of ran over from four to six hundred acres. These lakes that I spoke of are not fed by creeks or streams from which we draw our water for irrigation. They are just out on the open and gather the rain and snow water between the different streams.

3755 J. C. PADDOCK, Denver, Colorado.

Direct examination.

By Mr. DAWSON:

I live four miles southwest of Leadville and have lived there 24 years next month. Most of that time I have been ranching. For the last seven years I have been justice of the peace. I don't suppose there has been a year, hardly, since I have been up there but what I have been to the sources of nearly all of the streams that empty into the Arkansas river. We used to be hunting after cattle a good deal, and I was volunteer weather observer there for the Agricultural Department and I used to go up there to see what
3756 the conditions were. I was volunteer weather observer for about ten years. I think I began in 1888 and I ceased doing that in 1903. I made these reports to Mr. Bradenburg, the weather observer for Colorado and Wyoming, at Denver. The creeks and streams that go to make up the head waters of the Arkansas river are Lake, Half Moon, Tennesssee, the Arkansas proper, Evans, California, Iowa and Empire creeks; and the elevations at the head are approximately from eleven to twelve thousand feet. My ranch is about 9500 feet, and Leadville is 10,042 feet. I think the snow fall on the head waters of the Arkansas river and its tributaries in the locality which I have described is fifty
3757 per cent. less in the last few years than it was in an equal number of years, from my experience, and this is based on actual observation and measurements, as I took measurements from day to day as the snow fell and recorded the result. I think this decrease has been observable up there since 1895

although in the winter of 1898 we had a phenomenal fall of snow. The snow in that year measured, to the best of my recollection, 37 feet and 8 inches. That was the winter of 1897–8. It might have been in the winter of 1898–9; but with the exception of that winter I have noticed this falling off of the snow since about 1895. Taking it from 1899 to the present time, I should say that the snow fall is
probably less than fifty per cent. of what it was in the earlier
3758 years when I knew the country. As to the precipitation as a whole, including rains, the year 1903 was unusually dry. The precipitation was very deficient that year; but with that exception I think the average falling off in precipitation for the last four or five years has been probably about twenty-five per cent. from that of the earlier years. That would be my judgment. The falling off in the snow fall has been greater than the falling off in the total precipitation during this time. When I went there there was probably fifty per cent. more timber standing in this vicinity, that is, green timber, than there is now, but in 1878 and 1879 and a large part of 1880 there were enormous quantities of timber burned into charcoal for the use of the smelters there. But since the railroad came in and furnished coke there has not been that use of the timber for charcoal as before, in fact its use has entirely ceased now with the smelters. A great deal, of course, has also been used for lumber and for mining timbers. In my judgment there is not now more than five per cent. of the original timber standing, that is, of the timber that was standing twenty-five
years ago, within, I will say, twenty-five miles of Lead-
3759 ville. And this ninety-five per cent. has been destroyed either by cutting or burning off. In fact I don't know of any good timber that is now left standing in Lake county. That timber was what we call white pine—a dense, heavy growth of timber, that is, evergreen. And in the heavy pine timber it is impossible for the sun to penetrate the forest or reach the ground, and this when standing would conserve the snow supply until a very
3760 late period in the season. There is a little pitch timber that seems to be beyond the reach of human hands to get with any profit, and so it has been allowed to stay there, and I have seen snow in that timber in August. I passed along it about the 20th of August and there were large patches of snow about two feet deep and as solid as ice, so firm that we could not make any impression on it, while on the other portions of the country where the timber was denuded the snow had been gone for months. I should think there was a difference of from three to three and a half months from the time of the snow going off where there is no timber and where there is timber. Except in the very deepest draws and the most shady places the snow is all gone by the first of June, and in former years
when there was plenty of timber, and especially in the early
3761 '80's, we found frequently little patches of snow in the dense timber at the head of that creek in August. I think the small brush and undergrowth and some kinds of grass have been

almost exterminated, and for this there are two causes. One is the destruction of the timber which protected that undergrowth, and the other one is that for twenty years or over there have been about two hundred thousand head of sheep herded on us every year in our county, and sheep are very destructive of the grass as well as of the undergrowth. They eat it off closely, and destroy the tender undergrowth by browsing on it. The killing of this undergrowth
3762 and grass accelerates the disappearance of the snow and also furnishes very much less hindrance for the run-off from rainfall. As evidence of the violence with which the rains run off now more than formerly, there are channels that the water has washed down the mountain sides and foot hills near the base of the mountains. I have also noticed a falling off in the amount of water carried by the upper Arkansas and its tributaries, as there is a perceptible diminution of the flow in all of these streams from Granite up. That is about eighteen miles below Leadville, down the river.

The extent of territory drained by the Arkansas river and its tributaries in this vicinity is comparatively small, because we are pretty well up. The bed of the Arkansas river immediately below Leadville is 9,500 feet in elevation and we do not have to go
3763 very far to the timber line. When we get above timber line the peaks and sharp ridges are about the only source of preservation of the snow fall now, because the wind blows the snow into the gulches and deep ravines, and were it not for that I am afraid we would not have any water at all. When the timber was there a great deal of snow was blown off the peaks and high divides into it, and that stopped the snow that was moving on account of the wind.

Cross-examination.

By Mr. ASHBAUGH:

The general observations to which I have been testifying extend back to about 1880. I would say for the last four years the
3764 average snow fall has been not over fifty per cent. of what it averaged from 1880 to 1899, that is, leaving out the phenomenal snow fall of the winter of 1898–9. There did not seem to be any perceptible falling off prior to the year 1895, and only a slight falling off down to 1900, and from that on a greater falling
3765 off. I don't know that this falling off in the snow fall has been a matter of public advertisement and that it has been advertised as one of the advantages of Colorado.

I think that the amount of water taken out of the ditches and the enlargement of ditches increased very materially within the last three or four years. In spite of that fact I think there
3766 has been a falling off of the snow fall. I presume we have not let up any on the extending and digging of our ditches because of this falling off in the snow fall. That is my opinion. I

think Mr. Brandenburg publishes a monthly statement of all reports of volunteer observers throughout the State.

In speaking of the cutting of the timber on the drainage area of the Arkansas river near Leadville, I think there is no timber left in that vicinity that is worth cutting off that can be gotten. There are a few little patches high up in some rugged spots in the mountains that are still left, but they are insignificant.

There are a few good streams that come into the Arkansas river below Granite, but the principal supply I should judge is from
3765 Lake county. I don't know whether the records show that there has been any diminution in the flow of the river at Cañon City during the last few years. If these records show no diminution at Cañon City I would have to say there had not been much diminution at the sources of supply, I suppose. If the amount of water that flows in the Arkansas river according to measurements in our own State shows no appreciable falling off in these years, it might possibly indicate that the amount of snow fall was about uniform, but I think there are some sources of water supply on the upper Arkansas that cut quite a figure in our
3566 country here, and that is the drainage from the mines. That water never got into the Arkansas river before they began to pump it.

If the amount of snow fall has ever been decreased and the supply of water from the mines and other sources has increased, the amount of water that would flow in the Arkansas river at Cañon City might possibly remain the same. The original source before these mines were pumped was the snow fall and the rainfall. The loss to the river which might have come from loss in snow fall might possibly be supplied from other sources, and the flow of the river be
3567 accounted for in that way. The greater bulk of the snow is melted by the first of June. And in the latitude of Leadville it would be practically gone by the middle of July. But higher up toward timber line, where there are large bodies of timber, the snow would last until probably the middle of August and maybe later. The timber conserves the water. The snow melts slowly and enters the ground and is practically taken up by the ground and
3768 seeps off and of course finds a lower level, but where the sun exercises its unobstructed rays on the mountain sides the water goes off rapidly and of course the stream rises rapidly, but it soon passes away and is gone, so that the effect is that it melts earlier and runs off more quickly.

Redirect examination.

By Mr. DAWSON:

There are two particular mines here at Leadville that I know of that are raising nine hundred gallons of water per minute. There is the flow of the Yak tunnel, which penetrates nearly two miles

into the mountains. My judgment is that that stream is
3769 probably 100 to 150 miners' inches of water per minute. When I speak of miners' inches I mean a stream of water that will run through a square inch hole, under a pressure of four inches a minute. These other plants I speak of are pumping about nine hundred gallons each, and there are numerous others that I don't recall to mind. And all these go to feed the Arkansas river. I should judge there are as much again in the aggregate. I should think there was in the neighborhood of fourteen or fifteen cubic feet per second of time going to feed the river. All of that. The Yak tunnel is an enterprise that was begun, I believe, about seven years ago, but it didn't drain as much water as it does at the present time, until they struck the workings of the Ibex mine. That was a year ago last fall.

I have not attempted to enumerate all of these mines, but if all were enumerated it would amount to quite a volume of water.

3771 J. O. ALBERT, Denver, Colorado.

Direct examination.

By Mr. DAWSON:

I am fifty-five years of age, and reside in Berthoud, Colorado. I came to this State first in 1869 and located at Pueblo and remained there up until 1900. For two years of that time I was in Kansas back and forth, but still had my home there. I came from
3772 Pennsylvania to Kansas by way of St. Louis and Kansas City. They were building the Kansas Pacific road to Denver then and I came to the end of the track at Kit Carson, and from there I went south to the Arkansas river and proceeded to Pueblo from there, up the river. I think we struck the Arkansas river about April 1st 1869, and I walked from there to Pueblo. I came across with ox teams going to New Mexico. I reached Pueblo about the third or fourth of April. We landed at Bent's fort on the river and there was some water at that point at that time. I should think a man could ford the stream there easily enough. There was
3773 perhaps a couple of feet of water.

Three years later I was down on the Arkansas river as far as Coolidge. That was in August, 1872. And at that point there was no stream at that time. At Lamar or a little above that there was a little water. On that trip I was up and down the river looking for cattle. I didn't get across into Kansas at that time. I didn't go farther than the State line. Perhaps we were up and down the river between there and east of Pueblo about three weeks and held the cattle there at Rocky Ford.

3774 The next trip I made through that country was in 1879. We were feeding some cattle and sheep in Harvey county,

Kansas, and I started from Pueblo with two thousand sheep on the 20th of August. We followed the river clear through to Halstead, Kansas. There was water in the river down as far as Lamar, and then we didn't have any water to amount to anything. Once in a while there was a pool of water or something like that. We had quite a time after we left Lamar to get water for the sheep. We kept very close to the river and when there was any water we drove in and watered them. We crossed the river at Coolidge and kept on the north side of the river as far down as Syracuse. There we didn't find any water at all and thought we would have to turn back, but we kept going. At one time from the line to Syracuse, a distance of perhaps thirty miles, we didn't get any water at all. After we got there we dropped into the river, or beyond there perhaps three or four miles. We dropped right into the bed of the river and knew if there was any water there we would catch
3775 it. We drove there three days without getting any. We drove the sheep right in the bed of the river. There was tall grass on the banks and of course we couldn't drive the sheep unless we got out on higher ground. We stayed right in the bed of the river, and by "milling" them around on the third day we got a little water for the sheep. Their tramping in the sand, going around and around, would pack it down until the water would rise where they would travel. There was no running stream during the three days we travelled. There was not even any water standing in holes. We found no running stream until we got to the Pawnee.

3776 There were no ditches to my recollection at all unless it was a very small one at that time taking water out of the river in eastern Colorado or below Lamar. Perhaps just a few furrows ploughed where the water was easily gotten out.

I came back in the spring of 1880 on a train. As near as I can tell, where the Santa Fe road was running close to the river there was very little water, if any, along in that part of the country for one hundred and fifty to two hundred miles. I was down there on the river again in the fall of 1881. I held some cattle fifteen miles below Pueblo. I was along the river there for three years. Not taking care of the cattle every day, but I was down in that country once or twice a month all along the river between that and Lamar. I didn't get down as far as Coolidge, but as far as Lamar there was some little water in the river in those three years. It would get low during the summer and fall during each of these years, and there was always a little but not very much water. After say Sep-
3777 tember or along there there was some little water but not very much. When I lived at Pueblo I was engaged most of the time in the electrical business—the electric lighting and railway business. I was interested in a plant there, and before that I was in the coal business, and trading, and during the years I have
3778 spoken of I was interested in stock some of the time. I am not interested in any irrigation projects or in the use of water

from the Arkansas river or its tributaries at the present time. I am now living in the northern part of the State of Colorado, and have stock still in the San Luis valley, but none east of the mountains. During the time I lived in Pueblo I have noticed the times of flood or of excessively high water. These come mostly in May and June when it would rain through that country. Very heavy rain storms would sometimes occur along the base of the mountains on the tributaries of the river in May and June and sometimes in July. I have seen the river there half a mile wide and outside of its banks. These rises come suddenly, from cloudbursts and heavy rains up the river through that country. The character of the flow at Pueblo is very low. I have crossed that river perhaps as many as ten times a day for twenty-five years in matters connected with my business and for the reason that the Arkansas river divides the town of Pueblo
3779 so that the business is on both sides of the river.

Cross-examination.

By Mr. ASHBAUGH:

I struck the river in 1869 at Bent's fort but didn't see the river east of that. Bent's Fort was in the neighborhood of thirty-five or forty miles east of Pueblo I think. It seems to me that Bent's fort was not above Rocky Ford. I may be mistaken, though.
3780 Yes, the river was fordable. You could cross it almost anywhere. In 1872 I didn't go east of Coolidge, nor did I cross the river there. That was in August. In 1869 and 1872 I was in Pueblo most of the time and didn't see the river altogether dry there. When I found the river dry at Coolidge in August, 1872, there was water above that, and I supposed it had sunk in the sand, as far as I could see, When we found the water by having the sheep "mill" around in the river bed it came out of the
3781 sand, I suppose. It didn't come from any rain storm or *or* anything of that kind. I don't think there was any time during my observations along the river when you could not get water by digging down into the sand a few inches, and so far as I know that was always true. The water that I described as being in the sand came from the flowing water above, I should think. At least there
3782 were no local rains or showers to keep up that constant supply of water, and we found it in the bed of the river beneath the sands through Kansas just the same whether there had been a local rain there or not. At Pueblo I think there is more rain in June than there would be at other months. That comes from
3783 rains and snows in the mountains, and hence always increases the amount of flow in the river to the extent of the amount of the snow that was melting, and whether there were rain storms or not at that time the water would be increased some. The river bed has been straightened out at Pueblo in the last few years and narrowed somewhat, and for half a mile or so built up on each side with stone abutments.

(At this point the State of Colorado rested temporarily, in accordance with a stipulation entered into by and between the parties that the Government would proceed with its testimony and after it had submitted all the evidence it had the State of Colorado would thereupon introduce further evidence.)

Testimony Introduced by the United States Government as Intervenor.

DENVER, COLORADO, January 21–23, 1905.

3785 CLARANCE T. JOHNSTON, Cheyenne, Wyoming.

Direct examination.

By Mr. CAMPBELL:

I am State engineer of Wyoming. I was assistant State engineer of that State for four years and assistant in the office for six years, and was assistant expert in charge of irrigation investigations for the Department of Agriculture for four years. As State engineer of Wyoming I had general supervision of the appropriation, distribution and division of the waters of the State. As assistant en-
3786 gineer my duties were in connection with the field survey, the measurement of water and the office work, particularly relating to the preparation of maps and the recording of applications for permits. My duties as State engineer and assistant required me to travel over the State of Wyoming investigating the waters in the streams and the land capable of being irrigated. My duties in connection with my position with the experiment station of the Department of Agriculture related particularly to the duty of water and its use on the different streams in the West. In the discharge of my duties in this latter capacity it was necessary to make extended visits and observations throughout what is known as the arid region in the western part of the United States. I have been in Kansas, Nebraska, Wyoming, Montana, Oregon, Washington, Idaho, California, Arizona, New Mexico, Colorado, Texas and the western portions of Oklahoma and Indian Territory. I was also in Arkansas and Louisiana in connection with the irrigation of rice and similar experiments. Three years ago the present winter—the winter
3787 of 1901–2—I spent in Egypt. I was there for three months, and was engaged in preparing a report of my investigations there for nearly a year following my return. The report I made was published in Bulletin No. 130 of the office of experiment stations. All together I have had about sixteen years in different kinds of work connected with irrigation.

I have become as familiar with the lands in Wyoming as one can from the records we have there in the office, which are very complete. I would say there have been reclaimed from their arid state in

Wyoming about 1,100,000 acres up to date, of a value of at least $30 per acre. All the waters of the streams of Wyoming that are capable of being applied to the reclamation of land have not
3788 been appropriated nor are they being used. In addition to the land already reclaimed in Wyoming from its arid condition, I should say about four million acres could still be irrigated. The total value of this land which can be irrigated would approximate probably $150,000,000, and including the population that is directly and indirectly supported by such development, I think between 800,000 and 1,000,000 people could be supported from it ultimately.

I am familiar with the doctrine of riparian rights. I think it would have been impossible to reclaim the lands in Wyoming which have already been reclaimed if that doctrine were to prevail or had prevailed, and the effect of such a doctrine upon the future development of Wyoming would be to prevent such development largely.

3789 I consider the arid region that portion of the United States the eastern limit of which would be between the 99th and 100th meridian, and its western limit the Pacific ocean, its northern limit the 49th parallel or the boundary between the United States and Canada, and the southern limit the line between the United States and Mexico. Of course there are isolated tracts in this area that do not require irrigation. I do not believe the doctrine of riparian rights is applicable to any country where irrigation is necessary, because the doctrine of riparian rights gives the right to a property owner whose property abuts on a stream and does not imply beneficial use, consequently it enables those having riparian rights to control the supply without using it.

I am familiar with the doctrine which is by some considered a modification of the riparian rights doctrine, which prevails in California, Oregon and Washington, and which has recently been invoked in Nebraska. I do not think such a doctrine is applicable to the conditions prevailing in the arid region, and where the modification is made it seems to me it is in a way recognizing the doctrine of appropriation as soon as the water is used.

3790 I am familiar with the objects and purposes of what is known as the reclamation act passed by the United States Congress on June 17, 1902. The application of the doctrine of riparian rights would prevent irrigation development under that act almost entirely. The application of the doctrine which prevails in California and Nebraska would affect development largely in the same way, probably depending on how much the doctrine is modified.

I am familiar with the act of Congress known as the Carey act, passed August 18th, 1894, and to be found in 27 U. S. Stats. 372, 422, sec. 4. Wyoming has accepted the provisions of that act, and approximately, under it sixty thousand acres have been reclaimed up to the present time. 500,000 acres are in process of reclamation

The doctrine of riparian rights if applied in Wyoming would almost absolutely impair the value of this act.

3791 I have made some study of the effect of irrigation upon cultivated forestry. Forests can be successfully cultivated in the arid region and particularly in Wyoming by irrigation, wherever land can be irrigated. There is a necessity for the cultivation of forests in this region, as with the growth of agriculture the demand for timber must grow and the supply must be maintained. I do not think forestry could be successfully developed in the arid region without the aid of irrigation, except in regions properly adapted to it, where the conditions of the soil are different or the rainfall is greater than it is over the average of the western country. The doctrine of riparian rights, if apptied, would undoubtedly limit the development of forestry in the arid region. Probably ninety-eight per cent. of the possible development. That of course is a rough estimate.

3792 The following running streams in Wyoming have their sources in Colorado: The Laramie, the North Platte, Sand creek, and the Snake river, a tributary of the Green river. I know that the citizens of Colorado are taking the waters from those streams in that State and appropriating them to the injury of prior appropriators over the line. Two ditches that I know of have been completed and water is being diverted in the valley of the Poudre river, and the injury has become so pronounced that the case is now pending in the United States circuit court.

I have heard the claim made that Colorado contends that she has the right to take the waters out of the streams mentioned in Colorado to the detriment and injury of the citizens of Wyoming who have made prior appropriations. (Objection by defendants.)

3793 Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

I think the doctrine of prior appropriation would only be appropriate where the water is taken from the stream and actually used and the volume of the stream materially decreased thereby. The doctrine of riparian rights prevails in the State of Illinois. I think there would be no necessity for the doctrine of prior appropriation in Illinois. If the doctrine of riparian rights should be suddenly uprooted in the State of Illinois, and the doctrine of appropriation forced upon them, if there were no use made of the water which would decrease the volume of the stream, I believe the doctrine of appropriation would have no injurious effect. The doctrine

3794 of riparian rights could not be destroyed; that is, the object of the doctrine would not be destroyed if the volume of the stream were not decreased or the quality of the water were not impaired.

Q. Supposing the doctrine of riparian rights were forcibly destroyed, what effect would it have upon such a State as Illinois?

A. It would probably be injurious under the conditions prevailing there.

If there were no irrigable lands in a State like the State of Illinois, the doctrine of riparian rights would be proper and appropriate. The doctrine of riparian rights is useful to those States where it is applicable to their conditions and where irrigation cannot be carried on; and on the contrary the doctrine of prior appropriation is useful and beneficial to those States where riparian rights could not
3795 be applied beneficially and usefully, and I do not mean to be understood as saying that the one could be made applicable to the conditions that would be most useful for the other. In the application of these two doctrines conditions should be taken into consideration. The modified doctrine is where the doctrine of riparian rights is so modified as to permit the persons having property abutting on a stream to use the same for irrigation. These persons have the right to use the water for irrigation—the people that have the riparian rights or the property abutting on the stream. The original doctrine of riparian rights did not permit the diminution of the volu-e of water flowing in the stream. I understand the doctrine of riparian rights prevents a man from irrigating his
3796 own land bordering on the stream even if it did diminish the stream. I have read some of the decisions upon the modified riparian rights doctrine. This was some time ago. I have read a Nebraska decision. I believe that is the case of The Crawford Company vs. Hathaway, and I think that decision would lead me to the conclusion as stated by me as to the modified doctrine. (Objection by defendants.) As to what could be done in such States as the Dakotas, Nebraska, Kansas and Texas in the application of the doctrine of riparian rights or the doctrine of prior appropriation, I think the doctrine of appropriation could be carried across the State line, regardless—I think that would be the
3797 solution of the whole thing, to recognize the doctrine of appropriation regardless of State lines. I think if the conditions are different in a single State the policy and the theories upon which the administration is based should vary accordingly. I understand that perhaps Montana, Washington, Oregon and California have both doctrines prevailing within their borders and both are upheld. I think the reason is that each of these States just named partakes of both of the physical conditions that demand these different
3798 doctrines of riparian rights and prior appropriation. I believe that the States of Kansas and Nebraska could be divided geographically just as easily as the State of Washington, because the Columbia river in Washington is a navigable stream and riparian rights have accrued on the Columbia river in eastern Washington. It is true to a certain extent that on one side of the range of mountains in Washington the conditions are entirely different from those on the other side of the range, but there are places
3799 in eastern Washington where irrigation is practiced. I don't think it would be much easier to draw a line at the crest of

the mountains in Washington than to draw a line in the States east of Colorado. It would be more difficult in Texas because there is less irrigation and less water in the dry portions of Texas. But I think it would be a very simple matter to definitely define the portions of the State of Texas where the two doctrines should apply. The line might be rather crooked.

3800 Including all streams that have a substantial flow that could be used in irrigation, there are probably not over six or eight that have their sources in Colorado and then flow into Wyoming. The waters of the streams that I mentioned in my direct examination have been appropriated for use in Wyoming. As to the effect upon the development of the country along where the water has been appropriated in Wyoming, it would have been impossible to have progressed at all along agricultural lines in Wyoming if this water had been appropriated in Colorado. And if the water should be so appropriated it would absolutely prevent and ruin all development that had taken place. It injures the property that has grown up along the stream just as much to have some one above take all of the water whether a State line intervenes or not.

3801 There are streams running from Colorado into other States besides Wyoming that are similarly situated. There is the North Platte, which flows into Nebraska, the Grande river which flows into Utah, the Rio Grande, which flows into New Mexico, and in fact all of her streams, or a number of them, rise in the State and flow across her borders. Both branches of the Platte river rise in Colorado and flow into Wyoming and then into Nebraska, the South Platte flowing from Colorado into Nebraska directly. If all of the water in the branches of the Platte is appropriated and actually used in Colorado, it would destroy all agricultural development

3802 in both Wyoming and Nebraska and prevent any future development, and destroy the property already in existence to a large extent. It is my judgment that as a matter of justice there should be some control over inter-state streams—as a matter of justice to the appropriators who have gained rights to use the water by actual beneficial use. And that control should go as well to the benefit of the parties who at a prior time had settled on a stream below as though it were invoked in favor of prior appropriators who had settled above. In other words, I think that some equitable control should be exerted and exercised over those streams in favor of the real rights of the parties that exist as against subsequent rights that grow up to their injury.

3803 Cross-examination on behalf of defendants.

By Mr. DAWSON:

I mean by the riparian doctrine pure and simple the doctrine which requires that the waters of a natural stream be allowed to flow in their original course undiminished and unpolluted. I mean

by the doctrine of appropriation that doctrine which is recognized in the arid States as the appropriation and application of water to a beneficial use, the first in time being the first in right, according to use. By the modified riparian doctrine I mean that doctrine which, still recognizing the old riparian rights doctrine, has modified it to the extent of permitting those owning lands abutting on a stream to use water from that stream on which the lands abut, for the purpose of irrigation, and I understand that our doctrine of appropriation as used in Colorado and Wyoming is that we may use waters from a stream to irrigate lands even though they do
3804 not abut on the stream. The abolition of riparian rights, for instance in a State like Illinois, would not work anything like the hardship to the people that the abolition of the doctrine of appropriation would in the arid States, because the conditions are such there that the streams will flow as they are now regardless of the doctrine of riparian rights, while here if we abrogate the doctrine of appropriation we have lost the right to divert the waters from the streams on the lands which are not riparian. If we abolish the doctrine of appropriation in the arid States, that will practically return a large portion of the land to waste or grazing lands that are now cultivated; while if you should abolish the doctrine of riparian rights in the State of Illinois the condition of that country would not make it at all probable that any great amount of water would be withdrawn from the
3805 river, as it would not be necessary to withdraw it from the river and put it on lands where irrigation is not practiced.

I consider that agriculture is the highest use to which water can be put, next to domestic use, and undoubtedly irrigation would be more valuable than to allow the water to run in the stream, and can be made of the best use to the population of a country. Under the doctrine of appropriation rather than under the modified riparian doctrine the best use of the water can be made for the best interests of the population of a country. In a State where the land of one-half can be made productive only by irrigation and the other half is productive without irrigation, undoubtedly the doctrine of appropriation, if they could only recognize one, would be
3806 of the greatest benefit and the one that should prevail.

My observation has been that the best agricultural regions are those where irrigation is practiced. Other conditions being equal, irrigated lands will support the larger population, and that fact is demonstrated by the irrigated sections of the Old World as well as by those of this country. Irrigation has not reached its highest stage of development in this country; it has just begun. There are sections of the Old World where they have progressed much further. Egypt is one place where a better and more economical use and a larger yield is obtained from the water applied, as they make the same amount of water go further and produce larger results. The use of irrigation encourages and leads to intensive cultivation, and it also leads toward dividing the lands up

into smaller holdings. I have made some investigations and
3807 observations concerning the return of seepage waters. By "seepage waters" we mean that water which passes beneath the surface of the ground from ditches or irrigated fields to the natural channel of either the main stream or a tributary, and it has been my experience that wherever irrigation is practiced for any considerable length of time there is more or less return water. It is very difficult to say what percentage reappears, because the normal conditions have not been reached anywhere, but the return waters will undoubtedly increase from year to year as this water has time to reach the natural channel. My investigations along the line of return waters are in
3808 regard to lands that have probably not been irrigated over fifteen to twenty years, and the results as I remember them do not exceed thirty per cent. in any case. (Objection by complainant.) I believe that the return waters are increasing and will continue to do so. If a junior appropriator in Colorado should take water from a stream which has a senior appropriator in Wyoming, he has pretty nearly gotten all of that water for all time, and that is true with the exception of lands on the head waters of the North
3809 Platte where there is some irrigation. As far as Wyoming is concerned the return waters do not come back to Wyoming. The water is diverted into another drainage basin altogether. The investigation to which I referred was made on one stream where I spent a summer in making it, and the maximum return was thirty per cent. That is the water that I could actually measure at the mouth of the stream on the surface. In this instance there was such a formation as would naturally bring all of the water to the surface. By using the water near the sources of the stream you undoubtedly get the largest use of it; but there is a question as to whether the water has the greatest value at that point on account of the
3810 increased return from the crops that can be grown at lower altitudes. And after you reach the plains country such as you have in Colorado east of the Rocky mountains undoubtedly a greater use can be gotten from a stream near the mountains
3811 rather than farther away. I think that the waters which originate in the mountains undoubtedly have an effect upon the flow of water in such streams as the Arkansas river all the way through, and I should say that the larger part of the water which you find on the lower reaches of the Arkansas river is derived from its upper reaches, above, from the surface flow and the underflow returning from the waters which have been spread over the land in irrigation. Of course the tributaries from the plains along the river add something to it, undoubtedly.

3812 Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

I should say the higher use of water for irrigation comes more from the economical use of the water than the actual use of the water under the doctrine of appropriation. Under the doctrine of riparian rights it is not necessary to make beneficial use of the water. They have the water without using it. You have a certain right to that water that flows by your place without using it if you have a right in it at all, and if it assists in growing a crop it is equally beneficial. Undoubtedly it is as high a use as under the other doctrine, provided it is equally beneficial.

Undoubtedly the larger percentage of the water which is used for irrigation is lost through evaporation. There is no question in my mind about that. And it would be my judg-
3818 ment that it runs from seventy to eighty-five per cent., from the figures I have been able to secure; that is, that seventy to eighty-five per cent. is either lost by the evaporation from the ground, from the surface of the water in ditches or through plant life, or escapes underground in a way that cannot be accounted for. Of course where seepage increases it has been used a long time until the ground would become saturated and there would be more. For the first number of years while the ground is being saturated of course there would be correspondingly less water that would get back into the stream, even if it would be all used on the drainage area of that stream, depending on the distance of the irrigated land from the stream,
3814 the character of the soil, etc. I have been along the Arkansas river. Through the western part of Kansas and a very little in the eastern part of Colorado the condition is such that a good deal of the water is taken up by the soil and the sand in the bed of the river. There is water near the surface of the ground and it very probably has a very slow velocity, and in my judgment must have some movement. Undoubtedly water is being absorbed at the western portion and it come out east of there. That has been my experience in all streams, that it disappears and reappears. I know of no streams that flow into the Arkansas river in the State of Kansas of any size whatever that would affect the flow of the river west of the Little Arkansas that empties in at Wichita.

The average rainfall through the Arkansas River drainage in western Kansas as I remember it is something like eighteen or nineteen inches per annum.

3815 Recross-examination on behalf of defendants.

By Mr. HAYT:

Yes, I said that seventy to eighty-five per cent. of the water used in irrigation was lost by evaporation, consumed by plant life or es-

caped beneath the ground, and a very large proportion of it is lost by evaporation.

The studies of the Weather Bureau have so far failed to show, to my judgment, any change in climate from any effect of evaporation n the arid region in the vicinity of Cheyenne and along the east side of the Rocky Mountain range in Colorado and down to
3816 the Kansas line. That is my opinion. I have studied that considerably. That record has been kept for thirty years—the record I have. If there is a very small effect upon the conditions of the weather, it would probably take several hundred years to determine exactly what the effect would be. If it is an appreciable effect it might be shown in a few more years. That is a very difficult thing to get at.

I would not be satisfied on the point that in this arid region after cultivation heavy dews fall in places where before there was no dew. I have seen dew in the mountains and other places, even on the plains, where there has been no irrigation anywhere near,
3817 and before any special development had taken place along that line. My judgment would be that the dews are probably heavier on cultivated lands. I don't remember any case now that will enable me to determine with reference to the dews upon the lands that are irrigated as compared with the dews upon lands that are not irrigated; nor have I been able to tell any difference in regard to the dews upon irrigated land in arid regions growing crops and upon lands not irrigated immediately joining, and I have gone through them. Of course if you go from a plain where the grass is not heavy into an alfalfa field, for instance, you will probably find more dew there, but you cannot say that the amount of dew that is collected there is any different, because the alfalfa might prevent its evaporation and dissipation. I should not like to commit myself until I have been able to study it further on the point that the dew is equal upon the arid lands not cultivated to that on
3818 the alfalfa fields I have just spoken of.

A large part of the water that is taken up by evaporation undoubtedly passes away and falls elsewhere as rain. It is not destroyed. It is precipitated somewhere and it must increase the rainfall or the precipitation of moisture in some localities, undoubtedly. The water that evaporates on a plant is lost to the immediate locality where the plant grows the same as the water that evaporates from a ditch or field, undoubtedly. The water that goes into the formation of a growing plant is a very small part of the water that the plant uses, there is so much more evaporated from it, and ultimately the amount that goes into the plant itself is lost to the immediate locality; because the plant is dryed finally and it passes away as evaporation—as vapor. A great deal of the water in the case of alfalfa, I know from measurements that have been made, passes into the plant and then out into the air, and when the alfalfa is cut and dried a large percentage of the moisture contained

in the alfalfa passes into the air. Of course it still contains
3819 moisture, but it is a very small percentage of what is lost through the plant in other ways. Applying this to alfalfa pastured upon the ground as distinguished from its being cut and cured as hay, and fed upon the ground—grazed—that gets to be a pretty complicated question and I have never followed it quite that far. The question of the water in that case gets so complicated that it cannot be measured. It could be measured, I suppose, but I don't know of any experiments that have been made along that line. I think the water taken up by the growing alfalfa, when the latter is grazed off by stock upon the ground, is such a small matter as compared with the volumes that are necessarily used for irrigation that it would become of no value to the irrigator to spend his time in trying to determine it, and I could not determine it at this time and would not care to commit myself.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

3820 From all my experience and my reading of weather reports as far back as I have gone I have never seen anything that would lead me to believe that there has been any material change in the rainfall in eastern Colorado, as to increasing or diminishing. Seasons change and differ from each other, but the records thus far made would not lead me to believe that there has been any material change so far as the climatic conditions are concerned. This also applies to Wyoming. The average shows no change. As to Kansas, I have sometimes examined the records there, but my impression is that the records there are identical with those in Wyoming as regards no change having taken place, and it is my judgment that it is practically true in what is known as the arid region in western Kansas that there are series of years in which the records have been kept and show no material change one way or the other.

Recross-examination on behalf of defendants.

By Mr. HAYT:

I have read of the precipitation in the form of dew being
3821 measured separately from that in the form of rainfall. But in the rainfall measurements made by the Government that I am acquainted with the dew is not taken into consideration; it is not measured. And when the Government measurements of the precipitation of moisture are spoken of, that does not include the precipitation of dew. I should like to amend that in this way—that where the rain gauge has been kept in very close proximity to the ground, if the dew is enough to be appreciable at all it might be included, but as a rule these are kept above the ground, in cities, and at quite an elevation above the ground.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

A record has been kept of wind-storms in Wyoming during the last few years. I think there has been very little change in respect to the number of wind-storms and the velocity of winds in the last few years in Wyoming. My judgment leads me to believe that where the experiments are made the country is more sheltered than a few years ago, but you take the exposed plains and I believe there is very little difference in the wind. Where trees have been
3822 grown they temper the wind locally, acting as a wind-break. Nothing has yet been determined along the line as to whether the reclamation of the land and the cultivation of it has any effect on the wind-storms in Wyoming.

The assessed valuation of Wyoming is about $46,000,000. This is about thirty per cent. of the real value. Directly and indirectly, probably sixty or sixty-five per cent. of this is based upon irrigation as it is understood in the arid region. I would say that about
3823 seventy-five per cent. of the value of the property in the arid region is based upon irrigation. It runs higher elsewhere than it would in Wyoming.

My understanding is that the modified doctrine of riparian rights has been followed in certain localities in California, undoubtedly. I have read a work by Mr. Works, a lawyer of California, on irrigation. I consider him a pretty good authority on that subject. I think it could be said that the modified riparian doctrine has not been followed generally in California, although it has been
3824 in localities that I know of. If Mr. Works says in the work referred to that the following of the modified doctrine in California was injurious, I would consider it a correct statement with respect to that region.

There are excellent opportunities for building reservoirs to catch the flood and other waters in the State of Wyoming. There are two large reservoirs now being built under what is known as the reclamation act. The Pathfinder reservoir, one of them, is located near the mouth of the Sweetwater river, on the Platte, and will store, when completed, about a million acre-feet of water, and will provide a summer flow so that approximately three hundred thousand acres can be irrigated. The other project is on the Shoshone river west of Cody. It will store one hundred and sixty thousand acre-feet, and with the natural flow of the stream it is expected that one hundred and fifty thousand acres will be irrigated.

3825 The largest single enterprise in Wyoming where land has been reclaimed is at Wheatland, ninety-six miles by rail north of Cheyenne. They have, probably under cultivation and irrigation at the present time about twenty thousand acres. There are sixty thousand acres in the project, although something like forty thousand acres have been irrigated under this enterprise, and a reservoir which will store one hundred and twenty thousand acre-

feet has been built. The complete use of the water under the reservoir has not yet been attained. They are now irrigating twenty thousand acres. This enterprise supports at the present time probably about two thousand five hundred people in and around
3826 Wheatland. It has been in practical operation for ten years. It was started in 1883. In and around Wheatland was a prairie fit only for grazing before this enterprise was started.

Another prominent instance in Wyoming is the country in the vicinity of Sheridan, irrigated from the Tongue river and its tributaries. There are probably between fifty and sixty thousand acres irrigated in that locality. Before they started to irrigate it was probably a better grass country than a wheat country, but otherwise there was no difference. It was fit only for grazing purposes.
3827 A profitable crop could not have been raised before the application of water.

I have made some investigations with respect to what is called the underflow in the Arkansas valley, and from this investigation I would say that it is percolating water. I am confident of that. It is simply flowing water beneath the surface of the ground. I would not venture an opinion as to the source where it percolates from—whether from the stream or from rainfall.

The four million acres of land which I said could be irrigated yet in Wyoming is largely public land. In my judgment it cannot be made profitable and inhabitable without the application of
3828 the waters of the streams of that State. It is impossible to make it inhabitable and profitable without the application of the water.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

As to the waters beneath the surface of the Arkansas river, if they have a tendency to flow at all they would flow easterly in the Arkansas river. It undoubtedly has a slow motion down stream. The distinction between the underflow and percolating waters is that in percolating waters the water is broken up into fine films and there is no way to measure it exactly, while an underflow is water
3829 that is really flowing under the ground and the velocity can in some way be determined. It would be assumed from the measurements that have been made that the water does have a definite current in the Arkansas valley beneath the surface and in a particular direction. It disappears in one place and reappears in another. You have to assume that it moves. I think it has been measured in recent years, and my measurements have all been made on the surface, and I am satisfied that the water passes
3830 through the sand, so that it must have a velocity of some kind.

I presume I would be safe in saying that from sixty to sixty-five

per cent of the wealth of each arid State is due to the development of agriculture under irrigation. If I should make the comparison I would say that if you had the water in western Kansas down there that would enable you to develop that portion of the State and sixty-five per cent of the wealth of western Kansas would undoubtedly be due to irrigation.

3832 NELLIS E. CORTHELL, Denver, Colorado.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I have been a practicing lawyer at Laramie, Wyoming, for about twenty-one years. I came from New York. I studied law at Laramie. I am very well acquainted generally with the conditions
3833 prevailing all over Wyoming. I have been in every county, I think, in the State. I came to Wyoming twenty-five years ago. In the practice of my profession I have had occasion to give the subject of irrigation my attention. When I came to Wyoming there were about twenty thousand people there. There is now estimated to be about five or six times that number, and I think from three-fourths to four-fifths of that population is sustained directly or indirectly by the irrigation of the land. I should think that the property values directly created by irrigation would amount to twenty-five or thirty millions of dollars. A far greater proportion of the remainder of the property of the State is due indirectly to irriga-
3834 tion. Irrigation in Wyoming is only in its infancy. It is a difficult matter to express an opinion in respect to how much more property in value can be created in Wyoming by using the waters not now used in reclaiming lands, because it involves a knowledge of the quantity of water available and which I think is not known with any degree of accuracy, and it also involves the question of the duty of water under the progressive conditions and the changed conditions of climate and cultivation, so that opinions on that subject would necessarily vary very much. My best judgment is that a fully irrigated area of ten million acres is not an extravagant estimate of the possibilities, and from my observation of the farming and stock raising industry as it may be carried on there I think forty acres of irrigated land in connection with a proportionate amount of dry range land would support an average family of five.

Irrigated land in Wyoming is now worth from ten to a hundred dollars an acre. It is increasing in value with the development of the State and the process of intensifying the cultivation of land.

In my estimate of the number of people that forty acres of irrigated land would support I was speaking of the number
3835 which could be directly supported. Probably fifty per cent in addition could be supported indirectly.

I think I know what is generally termed the arid region of the United States. Wyoming is included within it.

I think I understand what is meant by the doctrine of ripa-
3836 rian rights. Taking the doctrine of riparian rights as allowing a reasonable use of water for irrigation, I suppose some reclamation would be possible under its application. It is possible that under that doctrine of riparian rights such as I have named as much land might have been reclaimed and irrigated there as is actually irrigated now under the doctrine of riparian rights as so understood. My understanding of the doctrine of riparian rights is to give all of the riparian owners on the stream the right to a reasonable use of the water for irrigation as well as other purposes; that is to say, distributing the water among all irrigators on the entire length of the stream. There is a vast body of grazing land in Wyoming irrigated from the streams, that is non-riparian. This land could not have been reclaimed under the doctrine of riparian rights if anyone should have complained.

I understand what is meant by the doctrine prevailing in California as laid down in the case of Lux vs. Haggin and in the case from Nebraska known as the Crawford Company vs. Hatha-
3837 way. As I understand the doctrine in those cases, its application to the arid region would very seriously affect the future development therein by irrigation because it would prevent people from investing money in such precarious property. It is hardly conceivable that under that doctrine the Government or anyone else would invest vast sums of money in the storage of water that they might be compelled to turn down the streams on the complaint of any lower appropriator.

Wyoming has a provision in its constitution similar to that of Colorado, claiming that all of the waters of the State belonged to it. The effect of the application of that doctrine upon the reclamation act, if it is understood to give the State the absolute ownership of the body of the water, would prevent anyone from investing money and making appropriations of water on a stream, I think, in another State. My judgment is that the application of either of these doctrines just mentioned would seriously affect the administration of the reclamation act.

There are a number of streams in Wyoming which head in
3838 Colorado. The Big Laramie, the North Platte and Sand creek are the ones that most readily occur to me. I know of my own knowledge that the citizens of Colorado are taking the waters from the heads of these streams in Colorado to the detriment and damage of prior appropriators in Wyoming. (Objection by defendants.) I know of a number of instances of that kind. I suppose the most conspicuous instance is that of the Water Supply & Storage Company located at Fort Collins, Colorado, which some years ago took out a large ditch from the west branch of the Laramie river and carried it into Chambers lake, from which it is carried down the Cache la Poudre in various storage reservoirs and ditches. This has undoubtedly injured the prior appropriators in Wyoming, in some years cutting them short in the supply of water. Only the part of

the seepage water that is lost in the ditch before it passes the divide comes back into the same stream. The water is carried
3839 over the divide and into the water shed of the Cache la Poudre which flows into the South Platte. There is also the case of the Divide Ditch Company, another company, that has a ditch known locally as the Columbine, and Dead Man's ditch, which takes water from Columbine creek and Dead Man's creek and turns it into Sand creek, and then by means of the Divide ditch it is taken out of Sand creek at a lower point and carried over the divide into Sheep creek, and thence into the North fork of the Cache la Poudre and down into the Poudre valley. The amount of water taken out of Sand creek by the Colorado people in 1902 was about nine hundred acre-feet. In that year there was a somewhat larger quantity ran down the stream than was taken out. I don't remember just the figures. There were at this time being irrigated from the
3840 waters of Sand creek in Wyoming about five or six thousand acres. The diversion of that water from those five or six thousand acres in Wyoming by Colorado ruined the crops that year. They got practically no crop. I know that the paper that is now handed me, which is attached to a document entitled "The United States Department of Agriculture, Office of Experiment Stations, Bulletin 133, by A. C. True, Director; Report of Irrigation Investigations for 1902," at page 100, is a properly delineated map showing the ditch known as the Divide ditch.

(Intervenor's Exhibit 1 offered in evidence.)

3841 According to this map, which I believe is right, Sand creek heads in the middle of township 10 north, range 75 west, and runs in a generally northerly course, passing the Colorado and Wyoming line in township 12 and running into the Big Laramie river in township 14 north, of range 74 west. The divide ditch is taken out, I believe, in section 22, township 11 north, range 75 west, and runs perhaps one-half mile along near the bank of the creek and then turns rather sharply to the east and runs for about a mile to a point where it passes over the divide between Sand creek and Sheep creek and is there discharged and allowed to find its way down into Sheep creek and along down into the La Poudre valley. Sheep creek flows into the Poudre, and the latter into the South Platte. The seepage waters taken from Sand creek through that Divide ditch down to Sheep creek necessarily go into the Poudre basin.

I know that water is being taken out of the Laramie, which is a tributary of the North Platte, and also out of the North
3842 Platte, for irrigation purposes in Wyoming. Water is taken out of the Big Laramie river and its tributaries, except the Little Laramie, for the irrigation of perhaps two hundred thousand acres of land. The waters of the South Platte are pretty nearly all taken out up here in Colorado. There is very little flowing down about Julesburg. The North Platte and South Platte form their junction at North Platte, Nebraska, about two hundred miles by rail

from the Wyoming line and one hundred and fifty miles from the Colorado line.

I was acquainted with the North Platte beyond the junction some years ago. When I came West in the early part of 1880 I
3843 stopped for some months at Central City, Nebraska, and the North Platte, which runs through that town, attracted my attention and aroused a great deal of curiosity at that time, because it was different from any other stream I had seen before. At the season of the year when the water should have been high there was very little water in the stream. I have seen it at the same period recently below Grand island near Central City. If there is any difference now it would be my judgment there is more water in it in the summer now than when I first saw it.
3844 My explanation for this is that it is a plainly observable phenomenon of all these streams in the arid country that up to a certain extent, which perhaps is not yet ascertained, the taking out of water on the head of the stream and on the small tributaries retards and saves the flood waters that would otherwise go to waste, and that several weeks or months later find their way back into the stream, increasing the flow during the dry season or the ordinary period of low water.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

3845 Where the water is taken out in narrow valleys on the headwaters it comes back very quickly, sometimes within
3846 two or three days. The amount of water that is lost by evaporation or absorbed by plant life depends on the amount of water put on the land and the conditions of the soil and
3847 the drainage of the stream. But I do not feel able to give the figures. I don't know whether the flow of the Platte river has been increased or not. I have heard complaint down there in Nebreska that the Platte has been dried up becaused
3848 of the irrigation in Colorado. I knew of such complaints in Nebraska by reading the newspapers and hearing people talk in Nebraska, but not of my personal knowledge.

If I understand the Supreme Court in the case of the Crawford Company vs. Hathaway, it is an attempt to apply the doctrine of riparian rights to one part of the State and the doctrine of appropriation to another part of the State, and it seems to me it would be an impossible rule, and having some knowledge, as I have, of conditions in that western part of Nebraska, which are very similar to the conditions in Wyoming and Colorado, it seems to me it
3849 would be disastrous, at least to the western part of that State, to enforce the rule. No, I would not go to the extent of saying that the Supreme Court did not decide that case wisely. I do not assume to pass upon the wisdom of the Supreme Court.

It is true that I have been associated in all my business life as

an attorney with business in a country where irrigation was the paramount feature, and that I am looking at it from the irrigation standpoint. I have been speaking in my testimony of conditions as they exist generally in the arid region without respect to any
3850 State lines or conflicting rights. If you ask for my personal opinion, I would say it is decidedly better to have the doctrine of prior appropriation or perhaps some modification of it established in the humid regions, in the State of Illinois or the State of Massachusetts or any other State of the Union, and in every part of the United States that I am familiar with. I think it would be better to have the extreme doctrine of riparian rights wiped out of every State of the Union. I am opposed to the extreme doctrine of riparian rights. I think there is a chance for irrigation in
3851 such States as Illinois, Iowa, Michigan or Indiana. I have gotten this far along in supporting the doctrine of appropriation, that I think now it is for the best interests of the whole United States to wipe out all the doctrine of riparian rights and substitute the doctrine of prior appropriation if it becomes a question between the extreme doctrine of riparian rights and the doctrine of
3852 prior appropriation. There are some undertakings in the way of irrigation now in what is known as the humid States
3853 that have been carried on for a number of years. As a practical proposition it appears to be a modification of the doctrine of riparian rights to allow a man to irrigate his own riparian lands, and makes it more reasonable, of course. That is my understanding of it as a lawyer. I don't know whether they ever had any irrigation of riparian lands by the owners of the lands in England or not. So far as I have examined the plan and purpose of the reclamation service, it is consistent with the doctrine of prior appropriation, and I think the use of water under the reclamation act and the doctrine of prior appropriation can both stand
3854 and be carried on in the State of Wyoming. I think the Government undertaking is highly important and perhaps essential to the use of all the water. I think that under the reclamation act of June 2, 1902, the lands in Colorado can be reclaimed and it can be made successful.

If the State of Colorado should claim the right because of her sovereignty to take all of the water of those streams arising in Colorado and flowing into Wyoming, that claim of Colorado would have to be overthrown or the plans of the reclamation service would have to be very materially modified. Take, for instance, the Pathfinder project on the North Platte river, which is located something like fifty or sixty miles below the Colorado and Wyoming line, and if the water of the North Platte rising in Colorado were the absolute property of the State of Colorado it would be quite necessary for the Government to either abandon the plan to impound that water or to move the reservoir up into the State of Colorado and get permission to store the water there or to make some arrange-
3855 ment with Colorado to let it down into the Pathfinder dam. That would be just as true whether the State of Colorado owns

the water or whether it controls it. The other instance I thought of is one in which the interests of the Government reclamation service might come in conflict with the claim of absolute right on the part of the State government. This same conflict might arise on the Big Laramie river. If this doctrine of Colorado should be carried out it might affect the reclamation service upon every stream flowing from
3856 Colorado into Wyoming. This would also be true in all cases where the claim- were made by the superior States that they owned the body of the water arising within their borders. This would affect the reclamation service in the western portion of Nebraska, the same as in the State of Wyoming. This would also be true of every State lying below the State of either Colorado or Utah or the mountain States where the streams happen to rise. I know where there is a conflict between the citizens of Wyoming and the citizens of Colorado growing out of the fact that the citizens of Colorado have made subsequent appropriations on a stream rising in Colorado and flowing into Wyoming to the deteriment
3857 of the prior appropriators of Wyoming. Such a case now exists in the United States circuit court for Colorado. It is pending here now and is to be argued to-morrow. (Objection by defendants.) The facts about that case are in brief as follows: The waters of Sand creek, as shown in Intervenor's Exhibit 1, were appropriated many years ago by the citizens living along that stream in Wyoming for the irrigation of lands there. All of the waters, I believe. In 1901 or 1902 a Colorado company took out the Divide ditch in Colorado and turned out a large part of the water over the divide into Sheep creek. The appropriators in Wyoming joined together in a suit for an injunction to quiet their title to the waters in that stream against the Colorado citizens and appropriators, and that is the case which is now before the court. The title of
3858 that case is Hoge *et al.* vs. Eaton *et al.* Another similar controversy arose some years ago and still exists—it is not in court but probably it will be soon—between appropriators in a similar case along the Laramie river in Wyoming and subsequent appropriators in Colorado who took the water out of the Big
3859 Laramie and turned it over into the valley of the Cache la Poudre. Such controversies as these might arise on any stream flowing from the State of Colorado into the State of
3860 Wyoming. If the claim be made and enforced that any individual State has a right of absolute ownership in the body of the water arising in any of those streams that flow from such State into the adjoining States, then that claim might seriously affect the Government reclamation service. I hardly feel competent to state what would be the wisest policy to pursue under such conditions, because it is an almost inconceivable state of things that
3861 such a claim should be seriously maintained any more. If such a claim as that were made and pressed I think it would be generally disastrous all round—disastrous to the reclamation service and to everybody. (Objection by defendants.)

Cross-examination on behalf of defendants.

By Mr. DAWSON:

When I said that I thought a large part of the development in Wyoming might possibly have been made under the riparian doctrine I did not mean that such development could have been made under what is known as the extreme riparian doctrine that has prevailed in many of the Eastern and Middle States. I do not
3862 think it could. I do not know that I would consider the modified riparian doctrine as in any degree equivalent to the doctrine of prior appropriation. As I understand the modern riparian doctrine to allow a reasonable use of the water by all of the riparian owners on the stream, it appears to me to give them equal rights irrespective of the time they began to use it. Thus it would have the effect of making them share among themselves any shortage of water in a dry season. I understand by the extreme riparian doctrine that prevails in many of the Eastern and Middle States that it requires the upper riparian owner to let the water flow undiminished in quantity and unimpaired in quality to all the lower riparian owners, subject only to what are called the natural and necessary uses—domestic uses, the watering of cattle, etc.—and
3863 this does not include irrigation as we understand it in the arid region. Under that doctrine irrigation in Wyoming could only be carried on by sufferance or permission on the part of the lower riparian owners all the way down the stream; but aside from that it could not be used as a matter of right at all.

The development in Wyoming of the agricultural land has been brought about by means of irrigation under the doctrine of appropriation, except a very small and inconsiderable amount. I do not think even this development could have been brought about under the modified doctrine of riparian rights, for the reason that nobody would want to invest any considerable sum of money or do any considerable work by mere sufferance, knowing that their rights are liable to be taken away from them at the pleasure of lower owners. Such a doctrine would throw such uncertainty around the whole matter that I think nobody would go to the expense
3864 and trouble to make the works necessary for irrigation. It is true that aside from the advantages of irrigation by the reclamation of lands in the arid regions the soil often permits more intensive cultivation and the raising of much more valuable crops than where the water cannot be controlled by the cultivator. It is along these lines that I said the doctrine of appropriation would be of more advantage, even in the humid States, if it were to be balanced against the extreme doctrine of riparian rights. It is a sort of insurance against drouth and unusually small rainfall. The irrigation of land also acts as a fertilizer of the land. At the time the riparian doctrine grew up in the United States there was very little irrigation, comparatively, in the United States. There was none at all unless it was in New Mexico and Arizona and some

of those countries that were settled, in the southwestern por-
3865 tion. The use of the streams for navigation, commerce and manufacture was at that time the chief use to which the waters were put, aside from the necessary uses for domestic purposes. I think the use of the streams in the United States has become less important, comparatively, in the last twenty-five or thirty years as a means of conveying the commerce of the country than formerly, and this of course is because of the building of railroads. The great objection to the doctrine of riparian rights in the humid States, if any would spring from the adoption of such a doctrine, is that it does not take into consideration the question of waste in any respect and does not put any value on water. The harmful influence of the doctrine of appropriation in my opinion, in the humid States, would be largely theoretical; that is, it might affect navigation in some degree. It does not seem to me that this would be probable
under the conditions named where the use of water would be
3866 necessarily slight and the streams are naturally large. My chief reason for stating a while ago my preference for the doctrine of appropriation even in the humid regions was that this doctrine puts a higher value on water than the other doctrine does and takes the element of waste into consideration, both of which are very important factors. I have noticed other streams besides the Platte where the late flow of water has been improved by the irrigation of lands at an earlier period in the season. That is generally true, I think, of all the streams in the arid region that I have any knowledge of.

I was located on the Platte river near Grand Island, Nebraska, off and on from the middle of April to the latter part of July in the year 1880. I don't think I was down to the river close enough to observe it very well until some time in May, and the water was very low. There were only here and there channels running between dry banks of sand all the way across the stream. I don't remember that there was very much difference in the appearance of the river
from that time until I left in July. It was perhaps a little
3867 lower at the latter time. The amount of water used for irrigation on the tributaries of the Platte above that point has been very much increased since that time. There was very little irrigation indeed in Wyoming then and nothing like as much in Colorado in the valleys of the Platte. I do not remember seeing the stream at this point since 1901. I have ridden along the banks of the Platte river in cars nearly every year from 1889 up to the present time, and of course have noticed it in a general way, and I couldn't say that I noticed any great difference in that stream during those years. It seemed to me to maintain its volume in about the same condition. The irrigation on the tributaries of the Platte commences early in the spring and continues right along through
the spring and summer to as late as August now by direct ir-
3868 rigation, and from the time it is put on the lands at the head-

waters it is seeking its way back to the stream, that is, where it is put on in large quantities.

The general rule is that the use of water for irrigation tends to equalize or level up the flow of the water in the streams that I am familiar with. Of course there are streams where the amount of land is proportionately large to the amount of water, where I think the soil absorbs practically all of it. It does not evaporate nor give back any appreciable quantity. But those streams are very few and they have not come under my observation. This land that has been reclaimed by irrigation in Wyoming, if it were deprived of water for irrigation the best of it, perhaps, would be worth seventy-five or eighty cents an acre and the worst of it perhaps ten cents an acre, and it would vary between those figures. That is the going price of dry land. Taking the actual area of land in Wyoming that is well irrigated, I think perhaps a fair average value would be from fifty to sixty dollars an acre. That is not allowing for waste por-

3869 tions that are not covered. If these lands were deprived of water for irrigation there are not many towns and cities of Wyoming that could exist at all. Others would be small hamlets supplying the range country and sheep interests, and as to population I do not believe there would have been any considerable increase in population since 1880 outside of the coal mining industry there and possibly some increase in the sheep raising industry if it had not been for irrigation. If the strict riparian doctrine were now enforced and the people living on the lower reaches of the stream made complaint and stopped the use of water there it would drive a large part of the population out of the State, unquestionably, and I think not more than one-third of the people now there would continue to live there and prosper if the strict riparian doctrine were enforced, and there would be no prospect of future growth under such conditions except in the mining industry and other things that do not depend in any sense on agriculture.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

3871 I have read the Carey act and have a general knowledge of its features and terms. As I understand its terms, its undertakings are undoubtedly based entirely on the appropriation of water, the securing of water rights sufficiently to reclaim the land, and that it is an indispensable condition in carrying out any under-

3872 taking under the Carey act. I believe it is a fact that before they can get a complete title from the Government they must show that the land has been irrigated. If the doctrine of riparian rights were strictly enforced the land could not be irrigated.

Development by irrigation has not reached its highest stage by any means in Wyoming in respect to lands already reclaimed. From my own experience and observation I believe two or three

times as much water is now used on the land that is irrigated as in very many cases would be necessary under more careful methods, and my judgment is that irrigation in Wyoming is still in a progressive state. It is just in its infancy. I think the first irri-
3873 gation act proper that was passed in Wyoming was in 1875. I did not live in Wyoming prior to 1880, but I know of lands there that were well sodded and in cultivation as hay lands at that time that obviously had been irrigated many years prior to any legislation in respect to irrigation, and I know that is historically true that lands had been cultivated for hay by irrigation there many years at that time. The usages and customs in Wyoming in respect to using the water for irrigation purposes prior to any legisla-
3874 tion were that the people took it as a matter of course and applied it as they pleased. Waters are being appropriated from the Snake river in both Wyoming and Colorado, and that is one of the rivers on which difficulties may arise between citizens of
3876 Wyoming and citizens of Colorado. Where water is taken from a stream which heads in Colorado by the citizens of Colorado and is taken over a divide and all of it goes into another water shed the return or seepage waters do not go back to the stream. I think they obey the law of gravitation and go on down.

I have been over a great part of Colorado, a considerable part of Idaho, a small part of Utah and a small part of Montana, and eastern Oregon and Washington, western Nebraska, South Dakota and Kansas, and the conditions mentioned in these States com-
3877 pare with the conditions in Wyoming. They are very similar. There are different degrees of rainfall, of course, and consequently variations in climate, but generally speaking there is a similarity of conditions all over that region. The origin of the bulk of the property in the States just mentioned is based almost wholly upon irrigation and the doctrine of the appropriation of water.

Yes, it is quite true that in many instances there is an underflow in connection with the streams in the arid region that is much greater than the superficial flow. This is true as to lower portions of the Platte and some portions of the Laramie river. The fact that the Platte below the junction of the North and South Platte does not show any perceptible decrease from irrigation in Wyoming and Colorado might not be affected by what is known as the underflow coming out above and supplying that. Irrigation in Wyoming and Colorado in no way affects this underflow. The seepage water of course follows the bed-rock or clay sub-surface, and in most instances comes in below the bed of the stream, so that it would first be noticeable in the underflow, and if there were more water thrown into the stream than might flow in the sand and gravel, it would appear on the surface as a superficial flow.

Recross-examination on behalf of defendants.

By Mr. DAWSON:

3878 In speaking of the underflow sometimes being greater than the superficial flow, I have made no measurements in that regard, but I do know as a matter of fact that the investigations of experts show that the water moves very slowly through the sand underneath the surface, and that it would take a stream—if we can call it such—many times the size of the surface stream, when flowing through the sand, to equal in quantity that lesser stream flowing on the surface. Especially would this be true through fine sand, and the beds of these streams when you get out on the plains are made up of fine sands, that is, most of them. Some of them are made up of boulders and coarse gravel, but the farther you go down from the mountains the finer the sand.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

3879 There is an underflow to the Platte river, and I judge it has always been there as a part of the natural flow of the stream and comes from the upper part of the stream necessarily. There are two Carey acts, one of them being a State law of Wyoming and the other one being an act of Congress, and upon my examination I referred to the act of Congress. This act of Congress became in force in the State when its provisions had been accepted by the State.

3880 I would not go to the length of saying that if a State claimed the right to own and control all the waters within its territory then the reclamation act of 1902 could not be successfully carried out along those streams that do not flow from one State into another. I think it would very seriously modify the plans, but it might be possible to carry it out very beneficially.

3881 And I think that it could easily be carried out upon streams that flow from one State into another. All the streams I am acquainted with have accessions in the lower States as well as in the upper States and are in large part supplied by snows and tributaries and springs in the lower States. Upon the supposition just made I think the reclamation act would do no good in Wyoming as to any water that fell or came from melting snows in Colorado except in cases where the water could not be impounded and held back, and I think this is good as a general proposition in all those States similarly situated.

3882 S. C. DOWNING, Denver, Colorado.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I am the secretary of the Wyoming Central Land & Improvement Company and also of the Pioneer Canal Company, operating in Wyoming. I have been secretary of the two companies for a little over two years. My father was secretary before I was, and I have been familiar with the companies for nine years. The Wyoming Central Land & Improvement Company's works are located on the Big Laramie river, and all the waters of that river except the waters which come in from the Little Laramie head in Colorado. About twenty thousand acres of land are irrigated under the ditch of that company. An appropriation was made for
3883 two thousand acres under that ditch in about 1869. For the lands under the Pioneer canal the first appropriation was made in the fall of 1878 and spring of 1879, the canal being enlarged in the spring of 1886. There are about twenty thousand acres under both the Wyoming Central Land & Improvement Company's canal and the Pioneer Canal Company's. Both of these canals take water from the same stream. There have been appropriations of water from the Laramie in Colorado subsequently to that made by these two companies, and the waters have been applied to a beneficial use in Colorado. The appropriation of waters in Colorado from this stream during a number of years has made us short of water, and if the ditches being built now by Colorado parties are carried through we will have but a very small quantity of water. (Objection by defendants.) And this would make the twenty thousand acres of land now being irrigated comparatively of no value. These lands are now worth from twenty
3884 to seventy-five dollars an acre. If this threatened appropriation in Colorado should be carried out they would be worth from about seventy-five cents to one dollar and twenty-five cents an acre. (Objection by defendants.)

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

3885 Besides the twenty thousand acres under the two ditches spoken of there are a good many thousand acres that would be situated the same as we are, which we do not own. (Objection by defendants.) If these ditches in Colorado should be constructed as proposed there would be approximately two hundred thousand acres of land in Wyoming along the Laramie river affected by it. (Objection by defendants.) That would also make the lands situated in Wyoming along other and similar streams about which I

have testified comparatively of no value should the same conditions be carried out. (Objection by defendants.)

3886 I am not familiar enough with the conditions existing in Wyoming outside of Albany county to state how many acres there would be in all, but in Albany and Laramie counties, not including the land irrigated from the Little Laramie river, there would be about two hundred thousand acres thus affected. (Objection by defendants.) In all the rest of the State there would be a great deal more than that and in the whole State perhaps in all nearly a million acres. (Objection by defendants.)

Cross-examination on behalf of defendants.

By Mr. DAWSON:

3887 I know that measurements have been taken at the State line on the Big Laramie river for a number of years past and that there has been found a considerable stream of water flowing into Wyoming each year, and the ditches of the ditch companies spoken of are dependent on this water in that stream. There are several tributaries entering the stream before it reaches the heads of our ditches after it passes the State line. They are very small creeks. One of them is known as Fox creek, and I am not familiar with the names of the others. They are small creeks flowing largely in the spring of the year. The head of the Pioneer canal is about ten miles from the Colorado and Wyoming line, in Wyoming. The heads of the other ditches are between thirty-four and forty miles, on the Big Laramie river. The Big Laramie river has been only

3888 within the last four years adjudicated; in fact it is in court now; and there have been no certificates issued for any exact amount of water. We proved up on our rights for so many acres. We will be allowed under the Wyoming law a cubic foot of water for each seventy acres irrigated, and when the final decree is entered we will have to put in our measuring devices. Up until the present time all the appropriators of the Big Laramie river have worked in harmony. When there was a shortage we would save all the water we could and turn it in for the lower users and get along the best way we could. We have secured a decree, but it is pending on appeal. We have secured a final decree from the board of con-

3889 trol, and the appeal is from that decision, and as to what the action of the Colorado appropriators may be after we have once secured a settled decree I am not able to state. We have not been able up to this time to go to any Colorado water user and say that we have a settled and determined decree unappealed from for any given amount of water. We have been using that water for a good many years for irrigation under the customs and systems of Wyoming.

3890 GIBSON CLARK, Denver, Colorado.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I am a lawyer. I first moved to what is now Wyoming in December, 1866. I lived in the Territory until 1872. For the next succeeding eleven years I lived in Nevada and Utah and returned to this part of the country and located at Fort Collins, Colo-
3891 rado, where I remained for two and a half years, and in December, 1885, I went to Cheyenne, Wyoming, and have been there ever since. In 1871 I was a member of the legislature of Wyoming. In 1892 I was elected a member of the supremem court of the State, which position I held until September 21, 1894, and for the succeeding four years was United States attorney for the district of Wyoming. In 1866 when I first went to what is now Wyoming there had been very little irrigation to speak of. There were people at that time in the neighborhood of Fort Laramie where I lived who had engaged to some extent in the irrigation of gardens for the purpose solely of producing vegetables and things for the table, and there was some irrigation on what was known as the Government farm near Fort Laramie. Since 1866 there has been very considerable development of what I might term the irrigation resources of the State. Many large ditches have been built and very large tracts of land in some instances have been put under cultivation by a single system of ditches, and in other localities very extensive settlements have been made and the land reduced to farming by means of smaller ditches.

3892 Speaking approximately, I should say that in the matter of irrigation ditches and reservoirs from five to ten millions of dollars, if not more, has been invested.

From general observation, I doubt if over ten per cent. of the entire assessed value of the State is due to the irrigation of land; that is because of the fact that lands are assessed at an extremely low valuation. I should think that forty per cent. if not more of
3893 the property valuation in Wyoming is due to the cultivation of lands by means of irrigation. I would like to explain in reference to my answer in regard to the assessed valuation, that I know of instances where lands are worth and for the purpose of paying an inheritance tax were assessed at $40 an acre that were placed on the assessment roll at a valuation not to exceed $2 or $2.50 an acre. My estimate of the value of land per acre, that has been irrigated, runs from thirty dollars to fifty dollars, according to the locality and the facilities for market.

The development of the irrigation resources of Wyoming is in its infancy. It is only within the last two or three years that the people in Wyoming who are interested in the development of the irrigation resources of the State and who believe and realize that

the permanent development of the State depends on that have been able to overcome the obstacles thrown in their way by what has heretofore been the dominant interest—the cattle grazing interest; and to-day the prospect of very great development in Wyoming is excellent, and many enterprises outside of the enterprises of the Government under the reclamation act are becoming going concerns engaged in the development of the State. I do not think irrigation has reached its highest development to-day, nor one-tenth of what it will be in the next ten or fifteen years.

3894 In respect to the number of acres of land which can be reclaimed by the unused waters of the streams of Wyoming if it is taken from the streams and applied to the land, from my own observation and from inquiry I think it is safe to say that at least fifteen per cent. of the lands of Wyoming can be, by means of its water resources, reduced to cultivation through irrigation. There are in the neighborhood of sixty-five million acres in the State. Just as soon as the lands are brought under some irrigation system, without any improvements on them, and without breaking the sod, they would be worth in the neighborhood of $30 an acre on an average. In my judgmennt if

3895 all the lands of Wyoming which could be irrigated by the use of all the water resources of the State were under irrigation it could easily support a population of a million people. It has now a population of probably about 120,000. Without the right to appropriate water from the streams for beneficial purposes it would have been utterly and absolutely impossible to have created the property which now rests upon irrigation in Wyoming, and if the doctrine of riparian rights were invoked and sustained there it would have the effect of absolutely prohibiting the future development of the State either by individual enterprise or by the Federal Government under the reclamation act. The landed property immediately adjacent to the streams and properly called strictly riparian lands might continue to have some value, but the other lands away from the streams, which are the best lands in the State, the best lands in any irrigated country, would become simply pasture land and could not be used for any other purpose, and would be worth from

3896 fifty cents to $1 or $1.25 an acre. The existing population would have to get out. Probably twenty-five per cent. of the people of the State would have to leave.

I am familiar with the act of Congress known as the reclamation act, and also the act of Congress known as the Carey act. If the doctrine of riparian rights were invoked in Wyoming I do not think it would be at all feasible to make either of these acts effective. The expense of acquiring from riparian owners the right to use the water would be so great that it seems to me it would be impossible to carry out either one of these acts.

I have paid considerable attention to the subject of irrigation, both as a lawyer and a citizen. I have been very much interested in it.

3897 I should say that the lands lying farther from the stream and up on the high lands above the immediate valley of the stream are the ones upon which you can get the best results generally. Experience throughout the entire country demonstrates that they are very much the best lands. The lands down in the valley of the stream are moister and the additional water that is placed in them for the purpose of making them sufficiently productive generally has had the result in the course of time of making those lands produce a very rank growth of grass. They become soggy. There is entirely too much water in them and they do not continue to be so productive as the lands better drained—the high lands. I am not a practical irrigator. I never irrigated an acre of land in my life.

3898 I have paid some attention to this present controversy between Kansas and Colorado. I know of the contention that Colorado makes—that as a sovereign State she owns the water because of a provision in her constitution. Wyoming has a similar provision in her constitution, practically. The Wyoming people do not claim that they are entitled to all the waters irrespective of prior appropriations beyond the State line. I think the consensus of opinion among lawyers of experience in Wyoming—and there has been some expression, perhaps something a little more than that, in one decision of our supreme court—to the effect that the practical effect of the declaration in our constitution—the declaration on the part of the people of the State that the State was the owner of all the waters flowing in natural streams or in lakes, etc.—that its practical effect was to declare that the waters of these natural streams were simply *publici juris*, and that the State had over those waters the same right for the purposes of irrigation, its appropriation and distribution, diversion, etc., the same rights which the State

3899 had over the navigable streams under the rule of the common law. No, we never believed and we do not now believe that that mere declaration in our constitution gave to the State or was the assertion on the part of the State of a property right in the water such as the State acquires in or to lands which, for instance, had been granted to it by the Government or buildings which have been erected on such land or anything of that sort, but simply that it gives the State the right to control these waters so far as they may be applied to beneficial use.

The Big Laramie river in Wyoming has its source in Colorado, and I think possibly the South Platte to some extent.

There is a company known as the Wyoming Development Company, of which I am the attorney. Its property is situated about a hundred miles north of Cheyenne in the neighborhood of a town on the Colorado & Southern railroad called Wheat-

3900 land. There are sixty-three thousand to sixty-five thousand acres of land under the irrigation system. I believe about twenty or twenty-two thousand acres are now under actual cultivation. The water for these lands is taken from the Laramie river

which heads in Colorado. The appropriation in Wyoming dates back to the 16th day of May, 1883. I understand that appropriations of water have been made from that stream in Colorado subsequently to that appropriated by the Wyoming Development Company. If the contention of Colorado, that it has the right to take all of the water from the Laramie river in Colorado should be sustained, it would be disastrous, absolutely so, to the Wyoming Development Company enterprise, and destructive of all the property rights invested in that, or the greater part of them.

In answer to your question as to whether the people of Colorado when they are adjudicating water rights pay any attention whatever to the appropriations from the streams in other States, I might answer that as a matter of law that is an absolute impossibility.

3901 I know what is understood as the arid region. I think it would begin about the 102d meridian.

The Wyoming Development Company has invested now about $750,000 in cash, on which they have had no returns during the last twenty years. In regard to the amount of population that this enterprise supports, there must be at least 2000 or 2500 people on what is called the Wheatland flats now, and the number is increasing day by day.

There are other appropriations of water from the Laramie river in Wyoming from near Fort Laramie to the Colorado line. The number of acres so irrigated must be in the neighborhood of

3902 200,000. If all of the waters should be taken in Colorado from the Laramie river, the greater part of this 200,000 acres, except that immediately on the stream, would become absolutely arid, incapable of supporting anything. The conditions prevailing in Wyoming are about the same throughout the entire arid region, so far as I have observed, from Montana down throughout New Mexico and Arizona. In my best judgment there could not be any future development of any practical account in the arid region under the doctrine of riparian rights. When I came

3903 to what is now Wyoming in 1886 it was a part of Dakota. It was the usage and custom at that time to use the waters of the streams for irrigation purposes irrespective of any law on the subject.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

If Colorado under the State sovereignty idea as to the control of water should take all of the water of the Laramie river in Colorado it would practically destroy the value of at least 200,000 acres of land now under irrigation in Wyoming. There are other streams rising in Colorado and flowing into Wyoming, and I did not

3904 include the North Platte river in my drainage area of the Laramie as given. And the same effects would unquestionably apply also to streams flowing from Wyoming into other States

No sir, we do not claim that it is the construction placed upon our constitution by the people of the State of Wyoming that they own and control the waters within its borders so as to take those waters from a prior appropriator in another State. I do not know
3905 of any bottom lands along any of the streams with which I am familiar, particularly the Laramie or the North Platte, that would produce, naturally, any kind of a crop except a hay crop. They are not such lands as would be compared at all with the lands through the Central, Middle and Eastern States along the river banks. The conditions were entirely different from what they are back in the humid States.

3906 If I understand the doctrine of riparian rights it is this—that one who owns lands which abut upon a stream owns those lands to the thread of the stream and that he has the right to demand that the waters of that stream flow as they have been accustomed to flow, and that his right does not depend upon use or disuse, and that his right in and to the waters is not an easement, nor is it an appurtenance, but is the land itself, and he has the right absolutely to demand that those waters flow as they were accustomed to flow. There were no lands in the State of Wyoming that were saturated by the waters of those rivers in the natural state before irrigation. I never heard, except once only, anyone claim or urge that the doctrine of riparian rights should be spread over the State of Wyoming, and that claim was made by an attorney who
3907 had just come from Iowa in about 1887 or 1888, and he relied upon some decision from the supreme court of Iowa. That is the only time I ever heard it in my life.

3908 By looking at things in Wyoming as they are I am unable to see how the application of what you term the "Colorado doctrine" could affect in any way whatever the operation and effectiveness of the act of Congress providing for the reclamation by this fund of the arid lands. The reason for my answer lies in the fact that all of the waters of the Laramie river have been appropriated, and, very largely, the waters of the North Platte river. I do not think there is the remotest possibility of the Government ever being able to affect the Laramie river or the section of country drained by it by the reclamation act. It cannot be made applicable to that particular section. If there were lands yet to be reclaimed on the Laramie and other rivers that rise in Colorado and flow into Wyoming, in such a case I do not think the Government of the United States could acquire the use of the water.

Cross-examination on behalf of defendants.

By Mr. HAYT:

3909 I lived at Fort Collins, in Larimer county, Colorado, from 1883 to 1885, and I should think at that time it had a popu-
3910 lation of 2000 to 2500 people, and the county about 9000. Irrigation was carried on quite extensively in that county in 1885.

I visited it again in 1896 and I found a great increase in population and a large increase in material wealth that in my judgment was attributed to irrigation very largely. When I left Fort Collins in December, 1885, I located in Cheyenne, and it was the general impression of the people around in the neighborhood of Fort Collins that the Cache la Poudre river had been utilized to an extreme extent and that not only could no more land be put under cultivation
by means of irrigation but that more land was under the
3911 ditches already constructed than could be successfully filled
with water at that time. The ditch farthest north on the Cache la Poudre river was a ditch that ran just through the outskirts of the little town of Eaton, seven miles north of Greeley, which is also on the Cache la Poudre. Since then the ditches have been extended until the ditch farthest north now is a little bit north of the town of Ault, which is something more than four miles north of Eaton. Observing those ditches, I should conclude that there has been a strip of country four miles in width north and south by probably twenty-five or thirty miles in length east and west added to the irrigable area existing at the time I left Fort Collins. That has resulted, in my judgment, from a more economical use of the water and from a better knowledge of the methods that would bring the best results from irrigation, and from the enterprise and energy and earnestness and intelligence of the people of that section of Colorado, untramelled by too many constitutional provisions and permitted to work out their own destiny without the aid of State officials
who are selected to look after the distribution of the water
3912 of the streams. I may say that I have relied upon the
fact which within my own knowledge has occurred in Colorado in the development of her irrigation resources as a reason for deprecating the system of so-called beneficent laws which have been in operation in the State of Wyoming. I have spoken of the country in Colorado in and about the town of Eaton, and I am familiar with that country, and with the Greeley country generally, and have passed through it time and again within the past few years. From all that I have ever observed, from conversations with people whose business it is to look after such matters in order to gather reliable statistics concerning them, the country from Eaton to Greeley is the most thoroughly developed, the most highly cultivated portion of the United States. I have known the people of that country around there since 1871, and they have taken the arid lands which were incapable of supporting anything, except forty acres perhaps would support a cow, and they have made themselves, as I look upon them, the richest agricultural people within the limits of the United States,
and the agriculture in that locality is absolutely dependent
3913 upon irrigation. If they were entirely deprived of the use
of water for the purposes of irrigation the lands would be reduced to an arid waste, practically. The people would be reduced to poverty. They would either starve or have to get out and go at some other business. In Wyoming we can put large areas of land

under cultivation, certainly every eighty acres of which will support a family of five or six people in comfort, and add tremendously to our population and make it a great and rich country as nothing else in the world ever can do but the judicious and economical
3914 use of water for the purposes of irrigation.

I think the provisions of the Carey act, when carried out, so far as it is possible to tell at this time, will in all human probability go through and be successful. They have been generally successful. Of course you will understand that under the operation of the Carey act one prime necessity in making it so is getting people to come in from other localities and settle upon these lands, which they would receive free, paying only for the water right, and it is becoming easier and easier now as time goes on to get people to come in and make homes on these lands.

3915 I am interested as an attorney in the success of the Wyoming Development Company, and I think the success of that company depends upon its right to use the water of the Laramie river for the purposes of irrigation. I am not a stockholder in this company. And I have always entertained the views that I do now about what is now called the "Colorado doctrine." I never heard it called so before until I came down here this time, and I didn't know it was a Colorado doctrine, but with respect to appropriators along these streams which arise in one State, and flow into another, the climatic conditions in both States being such as to render irrigation necessary in order that the resources of the soil might be utilized, I have always entertained the idea I now express. I have had, commencing as long ago as 1893 or 1894, many controversies with our State officials over the rights of the people who have settled on the North Platte river and taken out irrigation ditches and irrigated their lands. It so happened that
3916 although they had a second chance at the stream, they commenced to utilize the waters of that stream, commencing right up at the Wyoming line, long before the Wyoming people woke up to the idea that there was any use in attempting to do anything of the kind on the lands along the stream in Wyoming; and my opinion always has been and was from the beginning that those people in Nebraska acquired a legal right to the use of the waters of that stream which would be superior to any right which could be acquired thereafter by the people of Wyoming, and that the courts of Wyoming would feel their obligation to do right sufficiently strong to protect the people of Nebraska in what I considered to be their lawful rights. And I am telling you that my answer with respect to that is in no degree influenced by the fact that I am
3917 the attorney for the Wyoming Development Company. I am, in that capacity, interested in the result of that controversy, if there is such a controversy. In regard to the effect on the lands in Wyoming if it were possible for Colorado to stop the flow of the water in the Laramie river, as asked me by counsel for the State of Kansas, I would say that the ability of Colorado to stop the flow of the water

in that river is another phase of the situation, and I am very much inclined to doubt its ability to do it. Even if the river should be dammed, the dam would probably overflow in the course of time. Under the doctrine of riparian rights as I understand it, under the decisions as I understand them, the riparian owners may use the water to some extent for the purposes of irrigation. Some of them have laid down some pretty stiff rules about that. That means that the water shall be allowed to flow as it has been accustomed to flow, undeteriorated in quality and unaffected in quantity, but I think under the great weight of authority under the doctrine of riparian rights the riparian owner may use the water for agriculture and for domestic purposes provided he does not seriously diminish its quantity or impair its quality.

3918 In regard to the constitution of the State of Wyoming being practically the same as the constitution of the State of Colorado, so far as the ownership of the waters of the natural streams of the State is concerned, I know that the first section of the article on irrigation declares that the waters of all the natural streams and lakes is the property of the State, and I understand that such is in substance the constitutional declaration of Colorado. I think, now that you call my attention to it, the declaration in the constitution of Colorado is that the waters of the natural streams are the

3919 property of the public, subject to appropriation as may be provided by law, or something to that effect. I may be mistaken entirely about it.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

My recollection is that the irrigation began around Greeley prior to 1880, and I know that in 1883 the progress of irrigation along the Cache la Poudre river had so far advanced that it had become necessary to adjudicate the water rights along that stream.

3920 I think the town of Greeley was located in December, 1871, and that the development of irrigation that I have spoken of was subsequent to that time. It was my opinion from the very beginning that if parties in Nebraska had appropriated the waters of the Platte river and used them for beneficial purposes they would have a superior right to subsequent appropriations of the same waters in the State of Wyoming under the constitution and laws of Wyoming, and of course under similar circumstances I would hold that the same view as to prior appropriators in Kansas as against subsequent appropriators in Colorado under their constitution and statutes should prevail.

3921 J. A. VAN GESDEL, Denver, Colorado.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I am attorney general in the State of Wyoming. I have been such for seven years. I have resided in that State for fourteen years next May. Before coming to Wyoming I resided in Nebraska for three years. I have been over Wyoming pretty thoroughly, in every county in the State, and have observed, and, to a certain extent, have studied the resources and development of the State, also its characteristics and capabilities.

3922 The assessed valuation of the property for last year, I believe, was between forty-four and forty-five millions. Of that valuation I should say there would be ten to fifteen per cent. of it in irrigated lands. The assessed valuation is about one-third of the real valuation. Directly and indirectly I should say that thirty-five to forty per cent. of the property valuation of Wyoming has been created by and rests upon the appropriation of the waters from the streams and the application thereof to beneficial use. Of the lands in Wyoming now arid and uninhabitable and unprofitable I should say that five or six million acres can be reclaimed by the unused waters of the streams in that State. Land on an average, when it is reclaimed, before it is cultivated or any improvements placed on it in the way of cultivation or other improvements,

3923 is worth about $20 an acre. The lands which can be reclaimed would support an additional population, directly and indirectly, of a million to a million and a half. I estimate that a forty-acre tract of land well irrigated would support a family of five persons. I think it would do that in this country.

I have heard the doctrine of riparian rights discussed and know what the doctrine means as generally understood among lawyers and laymen. Under that doctrine I do not think it would have been possible to have brought Wyoming to its present development. The effect of the application of that doctrine upon the future development of the State would be very destructive.

I am somewhat familiar with the act of Congress known as the reclamation act passed June 17, 1902, also the act of Congress known as the Carey act, passed August 18, 1894. In those acts the public policy of the Government is set forth to some extent in its relation to the arid lands of the western country. I

3924 should say that the application of the doctrine of riparian rights in Wyoming would render these acts almost entirely inoperative. There has been some development in Wyoming to my knowledge under the Carey act. I couldn't say how much. I should say there has been reclaimed already under that act probably ten or fifteen thousand acres, but the irriga- works constructed are capable of reclaiming considerable more. Yes, the

act requires the taking of the waters from the stream and applying them to the land and reclaiming it from a desert state
3925 so that it will produce crops. No sir, I cannot conceive of a case in Wyoming where this could be done under the doctrine of riparian rights.

There are several streams that flow into Wyoming that head in Colorado—the Laramie, the Platte, I believe, and I think the Snake river also flows out of Colorado and into Wyoming for a short distance. Since I have been in Wyoming there has been a great
3926 deal of development along irrigation lines, and considerable of that development is along the North Platte in Wyoming and its tributaries. The North Platte and the South Platte come together at North Platte, Nebraska. I was familiar with that stream below the junction prior to locating in Wyoming. I have been back there frequently since I have lived in Wyoming. I own property below the junction of the two rivers. I do not think the flow of the river below the junction has been materially affected during the last fifteen years by the taking of water out of the North Platte in Wyoming and the South Platte in Colorado. I mean the average flow.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

3927 The irrigators of Wyoming along the North Platte river do not take all of the flow over and over again. If for two or three hundred miles they did during the irrigating season take all of the water, each succeeding ditch having capacity to take it and did take it, and even the return seepage waters, I should say that that would undoubtedly have an effect on the flow of the Platte river.

The reclamation act can be applied to the Platte river on lands lying in Wyoming, in fact there is one enterprise now under headway being applied on the North Platte river. If the Colo-
3928 rado doctrine, that she has the right to take all of the water of the streams that rise within her borders by virtue of her constitution and laws, should be applied to those streams that flow from Colorado into Wyoming, it would have a serious effect on carrying out the reclamation of the lands that I have just spoken of under the reclamation act. There is no doubt about that. I am familiar with the constitution and the laws of Wyoming, and as to the ownership of water, there is a similar provision in the Wyoming constitution to that in the constitution of Colorado. I do not think it is a correct construction of the constitution of Wyoming, nor is it a construction that is now generally held, that if parties in the western part of Nebraska had appropriated certain waters of the North Platte river or any other river flowing from Wyoming into Nebraska, Wyoming or any of its citizens would have a right to

subsequently appropriate all of the waters of those streams
3929 by virtue of her constitution or her laws. In fact our supreme court in a recent case has announced very clearly that doctrine. I think that decision as announced by the supreme court has been very generally accepted by the bar and the people at large in the State of Wyoming.

3930 The amount of land in the State of Wyoming that was productive before irrigation was begun would be insignificant in proportion to the amount of irrigable land in the State. There are really very few conditions that would physically allow the doctrine of riparian rights to be applied to the lands of the State of Wyoming, unless it could be stretched to the extent of allowing riparian owners to irrigate their lands abutting on the streams, and even then it would extend to an insignificant amount as compared with the present number of acres irrigated.

Cross-examination on behalf of defendants.

By Mr. HAYT:

3931 Several of these streams I have spoken of run through Wyoming and into Nebraska, and if the following doctrine appearing on page 22 of Kansas' bill of complaint in this case, reading:

"From the organization of the State of Kansas, the common law and the riparian rights herein claimed extended over the whole of the Arkansas valley and to the summits of the Rocky mountains, and had for many years prior thereto. By reason of the prior settlement, occupation and title of the inhabitants of the State of Kansas upon and to the lands situated in the valley of said river, including those upon the banks of said river, the State of Kansas and the owners of land in said valley did acquire and now have the right to the uninterrupted and unimpeded flow of all the waters of said river into and across the State of Kansas."

should be applied it would be absolutely destructive to us in Wyoming so far as the Platte valley is concerned, and if it was applied, so far as the Arkansas valley in Colorado is concerned, and put in force with reference to the Arkansas river in the State of Kansas, necessarily it would be equally destructive to Colorado.

3932 I would like to explain my answer to a question propounded by counsel to the effect that if the water were taken out of the North Platte river it would have the effect of diminishing the flow below in Wyoming to the amount taken out above the State line, that I cannot conceive of how the water can be absolutely taken from a stream in Colorado unless it was taken out and diverted into an entirely different water shed. It would be a physical impossibility to dam up and hold it all there, and if the water were taken out and converted into an entirely different water shed you would not then get any advantage, or very little if any advan-

tage, from seepage. If the water were appropriated in the State of Colorado and used upon the water shed of the Platte river, then there would be quite a material return to the stream in the way of seepage. If the water should be taken out and used for irrigation purposes upon the water shed of the river I think it would have the effect to some extent of sustaining the uniformity of the flow of the river below during the dry season, undoubtedly. In regard to there being no diminution of the flow of water in the main Platte river for the last fifteen years—although much of that water has been used for irrigation above—I will say that in western Nebraska
3933 along the North and South Platte rivers in the last ten years there has been a greater rainfall, I think, than there was prior to that. What has caused that I do not know, but the rainfall in the last five years has enabled farmers to raise crops without irrigation almost up to the west line of Nebraska, under favorable conditions of soil, that did not exist fifteen to twenty years ago. There is a good deal of irrigation or cultivation west of that that might have affected the rainfall in the manner in which I have stated, as there is a good deal in the amount of irrigable land both in the North and South Platte valleys. West of the junction it is increasing every year. It is being enlarged and extended every year. I would not like to answer the question as to whether that would affect or increase the rainfall in that particular locality, as I am not an expert on that. I don't know as to what the statistics of the Government observers show in regard to the increase of rainfall of which I have spoken; I am simply giving my own observation, being there
3934 quite frequently from time to time. In regard to the development of Wyoming under irrigation and the promise that it has given of greater development in the future from that cause, I will say that such development is dependent to some extent upon bringing in new settlers and that it is not a matter of slow growth comparatively. The settlement will not be as rapid in a State like Wyoming, naturally, as it would be in a prairie State like Nebraska or Kansas. I presume this growth is retarded somewhat by the fact that settlers coming in here are not familiar with growing crops by irrigation and they have to learn about that very largely and that it takes several seasons, no doubt, for them to familiarize themselves with the process of raising crops by irrigation.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

3935 The case decided by the supreme court of Wyoming that I have referred to is Wiley vs. Decker, 73 Pac. 210.

When counsel for the State of Colorado a moment ago read to me a part of the bill in this case I was not aware that when the common law was adopted in Kansas the Territory of Kansas extended over the whole eastern part of Colorado to the summit of the range of mountains.

Recross-examination on behalf of defendants.

By Mr. HAYT:

If that be a fact, I do not think it would have any effect toward lessening the destructiveness of the doctrine claimed.

3936 M. R. JOHNSTON, Denver, Colorado.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

Wheatland, where I reside, is located on the Cheyenne & Northern railroad, ninety-six miles north of Cheyenne. I have
3937 resided there since 1897. I have been superintendent of the Wyoming Development Company for the last sixteen years. As superintendent my duties are superintending the water, land, etc.—the running of the water. The company is engaged in the reclamation and sale of lands. Its property is situated in Laramie county, near Wheatland. Wheatland is about the center of the land. We claim now sixty thousand acres under our canals and somewhere in the neighborhood of twenty-five to forty thousand acres are under irrigation now. The water is taken from the Big Laramie. The condition on the Laramie when I went there sixteen years ago was that there was very little land under cultivation. I should say in the neighborhood of 2500 to 3000 acres. Of the land which
3938 has been reclaimed since I have been there, it had no value except as grazing land, which would be but a few dollars an acre. The land that is now under irrigation is worth from $35 to $60 an acre. When I went to Wheatland there was practically no population there; it now has a population of 2500 people in and around Wheatland. Most assuredly it was the irrigated land that brought that population there and that now sustains it. The land which has not been reclaimed and which it is contemplated reclaiming is worth now in the neighborhood of $2 to $2.50 an acre. When
3939 reclaimed it will be worth $40 an acre, and will support, when reclaimed, in the neighborhood of six or seven thousand people in addition to what we have. We have one reservoir there, supplied from the Big Laramie. Yes sir, it is necessary to continue taking water out of that stream to keep the lands reclaimed in their present state and to irrigate the lands we have in contemplation. The Big Laramie river rises over in the State of Colorado. If the waters of the Big Laramie were appropriated and diverted and used in the State of Colorado, its effect upon our enterprise would be simply ruinous.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

3940 If the Colorado doctrine of the right to take all of the waters of a stream rising in the State of Colorado and flowing into

another State, by virtue of her sovereignty and her constitution, should prevail, it would ruin our improvement company and our progress and the property that we have been accumulating. I should say that the same result would follow as to other streams similarilly situated.

Cross-examination on behalf of defendants.

By Mr. HAYT:

3941 We would be in the same boat if we were compelled to leave the water in the river to flow by without use into the State of Nebraska. The Laramie is a tributary of the North Platte and runs from Wyoming into the State of Nebraska. Our enterprise is located in the neighborhood of 175 to 200 miles or thereabouts from the headwaters of the Laramie river, and I should say according to the map it is all in Wyoming, with the exception of twenty-five
3942 miles, and the area drained by the river is all within the State of Wyoming except twenty-five or thirty miles which lie in Colorado, and this is in the mountains of Colorado. The Little Laramie comes in above the place where we divert water. I think, from my information and what I can find out from other parties, that the principal late supply of water from the Laramie river comes from the higher ranges in Colorado. A number of these tributaries of the Laramie river take their rise in the moun-
3943 tains also, and I say it draws its principal supply from Colorado on account of the snow and height.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

The lands along the Laramie river before there was any irri-
3944 gation were simply arid, pasture lands, so that no cultivation to any marked extent could be carried on along the banks of the river without irrigation, and this aridity of the land extended down to the banks of the river.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

Wheatland has about 1200 inhabitants. They are dependent entirely upon the irrigated land there. Should either of the conditions prevail in respect to which I have been interrogated by counsel for complainant and defendants, it would practically render the property in and around Wheatland worth nothing, and the population could not exist there under those circumstances. We have
3945 some stock feeding there. We are feeding about 30,000 head of sheep this year. The feed we give them is raised on the lands in and around Wheatland. No sir, that sheep feeding enter-

prise could not be maintained if these lands were in their arid condition.

Recross-examination on behalf of defendants.

By Mr. HAYT:

Since we have constructed our reservoirs sometimes there has been a surplus of water going by and at other times we have not
3946 had enough. During the last year we have been blessed with plenty of water, and I think from the three canals we have in our system we take all together between seven and eight hundred cubic feet of water per second of time, and part of these canals are constructed to take water from the Sybelle creek, and the Sybelle receives its supply of water out of the Blue Grass, and the Blue Grass from the Little Laramie. We divert the water out of the Laramie river through a tunnel thirty odd feet long into this Blue Grass. That runs some sixteen or seventeen miles and flows into the Sybelle. After the water goes into the Sybelle, I think about a mile, we take out our large canal. And then it goes on down the creek and we take out what we call No. 3 canal, and then No. 2 still farther on down, from the Sybelle creek. In the early spring for a few days sometimes the water is augmented by that in the Sybelle creek. In some seasons it practically affords us none. The north bound-
3947 ary of our lands is the Laramie river at present, and we propose to irrigate land right up to the bank of the Laramie river. A certain amount of drainage from these lands goes back to the Laramie river, I should judge, but I couldn't say. Well, yes, it practically all goes to the Laramie river. Some of it goes back into the Sybelle and some into the Chugwater. We have found that the impounding of water in reservoirs is practicable and beneficial.

3948 A. L. FELLOWS, Denver, Colorado.

Direct examination on behalf on intervenor.

By Mr. CAMPBELL:

I reside at Denver and am the district engineer of the United States reclamation service. That service was organized under the direction of the Secretary of the Interior for the purpose of carrying into effect the reclamation act of June 17, 1902. I have been connected with the reclamation service since its inception as district engineer of the United States reclamation service for Colorado; that is, since July 1st, 1902. Prior to that time I occupied a similar position—resident hydrographer of the United States Geological Survey—for a period of some five years. The reclamation
3949 service in Colorado primarily has been making reconnoissances and preliminary surveys to determine the possibilities of reclamation throughout the entire State and the arid region;

secondarily, after making these surveys, it has fixed upon what is known as the Uncompahgre Valley project in western Colorado for first construction in Colorado. Two million five hundred thousand dollars have been set apart for that project, and construction is now under way. That project contemplates the diversion of water from the Gunnison river in western Colorado to the Uncompahgre valley by means of a tunnel some six miles in length for the irrigation of approximately 125,000 acres of land in the Uncompahgre valley,
which is in western Colorado, the principal towns of which
3950 are Mentrose and Delta.

Preliminary investigations have been made of what is known as the White River project in northwestern Colorado, which contemplates the irrigation of possibly 80,000 acres. After the preliminary investigations were made this was put aside temporarily. It will probably be taken up some years later.

Preliminary investigations and surveys have also been made for the Grand River project on Grand river in the vicinity of Grand Junction. It is looked upon with favor by the officers of the reclamation service and it is probable that it will be the next undertaking in the State. That project will irrigate approximately 60,000 acres of arid land in the vicinity of Grand Junction.

The last project investigated with any degree of thoroughness is the La Plata project on the Animas, and the La Plata reservoirs in southwestern Colorado and nortwestern New Mexico, from which,
with the aid of storage, it is expected to irrigate about 60,000
3951 acres of territory in that locality, in the vicinity of Durango in Colorado and Farmington and La Plata in New Mexico.

One other project has been carefully examined in eastern Colorado on the South Platte, generally known as the Pawnee Pass Reservoir project, but it was found that the water supply was insufficient for that and it has been abandoned. The others we have in contemplation.

Of the land proposed to be irrigated from the Gunnison project,
a portion is partially irrigated at the present time. The land
3952 which is entirely arid is worth nothing—absolutely worthless. Of the 125,000 acres proposed to be irrigated I should say 100,000 acres is arid. When this 100,000 acres is properly irrigated ten million dollars would be a fair valuation for the whole and it would support an additional population in the neighborhood of 25,000.

Of the project which will irrigate 80,000 acres on the White river, it is now practically all arid, and when irrigated and cultivated it will be worth $50 an acre. When irrigated these lands will probably support an additional population of six to eight thousand.

Of the 60,000 acres proposed to be reclaimed on the Grand, the
entire tract is arid. I consider that $100 an acre is a low
3953 valuation for that land, with a good water right attached.
Those lands when irrigated will support a population of 15,000.

As to these different projects which I have named, no use is being made of the waters with which we propose to irrigate them. If it should be held that the waters intended to be so used should be permitted to flow as they are now flowing it would be entirely impossible to reclaim the lands I have spoken of. I am familiar with the doctrine of riparian rights in a general way. If that doctrine were applied in Colorado it might absolutely prevent the operation of the reclamation act. To explain the word "might" I
3954 would have to state that my view of the riparian doctrine contemplates allowing the water to pass down the river undiminished in quantity or quality, and if that were enforced it would prevent the carrying out of the provisions of the reclamation act or prevent the attainment of the objects contemplated by it.

All of the streams along each of these different projects flow into another State or Territory. If the citizens of these other States or Territories into which these streams flow should insist and succeed in their contention that the water should flow down undiminished and unaffected, this would entirely prevent construction under the reclamation act.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

My jurisdiction is not confined to Colorado entirely, but so much so that I do not speak with authority concerning other States.

When I spoke of the doctrine of riparian rights I had in
3955 mind its enforcement along the entire channel. If the waters of some of these streams had been used for beneficial purposes for years prior to their application in the State of Colorado and then we should proceed in the State of Colorado and take them all, it would destroy the development such as you have supposed.

Of course that must be taken into consideration in these ques-
3956 tions. Our effort has not been made in the carrying out of the reclamation service to take the waters of streams that have been applied or appropriated or used in any way below the State line of Colorado. We have tried to avoid it under such conditions.

We have no projects on hand at the present time in the Arkansas valley. One reason is that we did not care to undertake any as long as this controversy was under way, which was begun before the reclamation act was passed. No projects could be reasonably begun or carried on in the Arkansas valley until this contro-
3957 versy is settled, nor would we undertake any until the settlement of the controversy. We have made investigations on the Arkansas river, but have determined on no projects. We have not determined upon any construction whatsoever, nor seriously considered it, until this controversy is settled, and our investigations are now being held up on that account.

Cross-examination on behalf of defendants.

By Mr. HAYT:

The Gunnison river furnishes sufficient water for the projects we have in view. That would necessarily contemplate reservoiring the flood waters within a few years.

3958 We have been making a very thorough study of the Rio Grande river, but the conditions are somewhat similar on that stream so that practically at the present time we are prohibited from undertaking any construction. I mean by that that they are similar to the Arkansas. There is no such inter-state controversy before the courts at the present time, but pending the claims of the Republic of Mexico, the Secretary of the Interior has forbidden the use of the Government lands for storage on the headwaters of the Rio Grande, and for that reason and for like reasons somewhat similar to those existing as though it were an inter-state controversy we cannot undertake any actual construction until those questions are settled.

We have paid no attention to the claim of people living in California to the Colorado river in the prosecution of development on the Gunnison river. We have taken it into consideration, but have

3959 believed that the conditions were such that we were warranted in passing it by. Our department has proceeded upon the theory that the claim was not well founded, and the department has undertaken to determine that question as between the contestants. We think the facts speak for themselves so plainly in that case that we are warranted in ignoring their claim. My opinion is that the building of reservoirs at the headwaters of the Rio Grande would be a detriment to the flow of the water in the river below the Colorado line. I think the term "average normal flow" is something that is so differently understood by different people that I generalize a little in my answer and say that in my opinion it would increase the low water flow to some extent. How much I am not prepared to say. But that the average flow which has passed the State line in preceding years will be lessened. As a general proposition, in speaking of the advantage or disadvantage of constructing reservoirs generally throughout the mountains of Colorado and storing flood waters therein, I think it

3960 is extremely advantageous. I could not state it strongly enough. The greatest advantage, in my mind, of such storage would be the extended use of the water. The flood waters are not stored. A certain proportion of them, and generally a very great proportion, is bound of necessity to go to waste. The storage permits an extended use of the available water supply, and possibly its complete use, that depending, of course, on the amount of storage. That may be due and generally is, in part, to the fact that the higher the water is stored the less will be the evaporation and the less will be the loss by seepage. The other conditions that enter into the storage of water are

practically secondary to that named condition of utilizing as much as possible of the entire flow. But one of those secondary conditions of a great deal of importance is the equalization of the flow. Where water is allowed to flow down the stream normally, without equalization, the results are often disastrous to the headgates that attempt to take water out from the stream, and to the best use of the water, the best use depending to some extent on the character of the water. Where the water is equalized in the way I have suggested the result is usually that the water is much clearer and much freer from sediment and does not fill up lower reservoirs and irrigation canals to the same extent that it does when it is allowed to flow down normally and be taken directly from the stream without the interposition of storage. These I would say are the principal advantages in the storage of water. I am inclined to think the storage of water on the Arkansas river might result in benefit by lessening damages from floods in Kansas. I am familiar with the great destruction of property along the Arkansas river in eastern Colorado, and to some extent in western Kansas, by the floods in the Las Animas river last fall. I believe it is feasible and practicable to construct reservoirs to store sufficient quantities of the waters of such a stream as the Las Animas river to prevent or lessen the danger from those floods, and that water when stored could be put, of course, to beneficial uses, such as irrigation, and the furnishing of power, and other enterprises.

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Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

The storage of flood waters holds those waters back from running to waste in the spring and in high water times so that they may be beneficially used during the dry season, and that is the great advantage in the storing of water, so that it may be applied when the water is most needed and when there is the least of it flowing in the river naturally. An extensive system of such storage as I have suggested would result in equalizing the natural, normal flow of the river. In response to counsel for Colorado in reference to the floods of October, 1904, I did not mean to say that storage would prevent the floods but that it would lessen the danger. The system of storage of flood waters would not depend upon the fact that we might not be able to store all of the flood waters at an extreme and very unusual flood, but the flood waters of the rivers of this State (Colorado) might be so stored and not run across such an extreme flood as would be disastrous to the system. I am satisfied that the conditions in the Arkansas valley might be improved by means of storage. If all the waters of a stream like the Arkansas were diverted by successive ditches and canals for irrigation for 250 miles through the eastern part of the State of Colorado it would undoubt-

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edly lessen the total volume very materially, and this would
3964 especially be true if each of those ditches or a number of them were sufficient in capacity to take the whole flow of the river at low water and did so take it at such seasons.

It would be impossible to answer with any degree of accuracy what has been the average percentage of evaporation and loss of water by absorption by plant life in irrigation, even in the same county or along the same streams, because they vary so widely that it is utterly impossible to give a very specific answer; but in general I should say that we may assume that of water applied in not too great quantities in irrigation perhaps fifty per cent. should enter into plant life, twenty-five per cent. pass off in evaporation and twenty-five per cent. flow back to the stream as return or seepage waters. In other localities the proportions would be more nearly even—say thirty and thirty-five per cent. This depends upon the soil, the time of the year, the aridity of the soil, the winds and other climatic conditions, so that the figures I have given are gen-
3965 erally an average. Return waters pass through the ground very slowly, and waters applied to lands far distant from the main channel may be years in returning and the velocity of the current underneath depends very largely upon the soil and the slope of the country.

Recross-examination on behalf of defendants.

By Mr. HAYT:

We, the engineers of the reclamation service, have made measurements of the flow of return waters and we have never found anything as rapid as ten feet per day. All measurements we have made have been less than ten feet per day. I should say an average would be four or five feet per day.

The fifty per cent. of the water that I spoke of which goes into plant life is not lost or destroyed. Of course matter is indestructible and eventually it returns to the earth in some form. The
3966 fifty per cent. or thirty per cent., as the case may be, entering into plant life is a part of the "fly-off" as it is generally called. It is a part of the evaporation; that is, it has equalized that evaporation as fly-off and the part remaining as a constant element of the plant itself is extremely small—infinitesimal—and of course eventually and through processes of oxidization, etc., passes into the ground again.

I do not think the irrigation of crops in Colorado and other Western States for more than forty years, even with the vast acreage under cultivation by irrigation in Colorado, and the many thousand acres of land covered by reservoirs filled with water during some portion of the year, has had any appreciable effect upon the climatic conditions in Colorado with reference to the humidity of the atmosphere and the precipitation of moisture. This amount of water that is taken up by evaporation necessarily passes into the air as

vapor and is eventually deposited in the form of rain or snow—precipitation—upon the earth's surface, and in general it must be in the country to the eastward of the country irrigated, because the prevailing winds of this region are from the west, so that if
3967 there is any appreciable effect it will be felt in the regions to the east of the districts irrigated in the Arkansas valley, and if as a matter of fact it could be demonstrated that there is an increased rainfall in the districts immediately east of Colorado, it would be natural, I take it, to attribute that to some extent to the increased use of water for irrigation to the west. I am personally of the opinion that the cultivation by irrigation in the Rocky Mountain regions has had some slight effect upon the precipitation in the form of dews; that it has increased the humidity of the atmosphere to such an extent that there is a slight increase of dew; but I have no demonstration of the fact. If the dews were more heavy on an alfalfa field in the morning than they were upon an arid tract of land immediately adjoining that, it would be a natural inference, I think, that the deposition of dew was increased by the irri-
3968 gation practically to the extent of the amount of the dew fall.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

I do not think that the rainfall in western Kansas has been perceptibly increased within the last few years. Rainfall varies so widely in different years anyway that only long, protracted measurements of precipitation can furnish any very definite information.

If a system or a series of canals for irrigation should be carried on for 200 miles along the river, taking during the irrigating season all of the water, and seventy-five per cent. of that should be evaporated and absorbed, it would have a very great effect upon the total flow.

3969 Recross-examination on behalf of defendants.

By Mr. HAYT:

The Weather Bureau of the Department of Agriculture, I believe, takes into consideration the relative humidity of the atmosphere and does keep memoranda as to the amount of dew-fall. That is dependent to a great extent upon the humidity of the atmosphere. It is practically directly dependent on that, and is more easily measured in that way, I believe, than by direct measurement, so that my impression is that no direct measurements of dew fall are kept except as may be apparent to the eye and incorporated in the
3970 form of memoranda. It is usually the case, but not always, that these measurements are taken in the cities or towns at an elevation above the surface of the ground, and one would hardly

expect the precipitation in the form of dew to show at any considerable elevation above the ground.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

I am familiar with the irrigation in the Arkansas valley in the State of Colorado as it has been carried on for the last ten or fifteen years. The effect of this irrigation in Colorado and the taking of water in Colorado for that purpose has materially lessened the flow of the river through the State of Kansas, I believe.

Recross-examination on behalf of defendants.

By Mr. HAYT:

I have had charge of the measurements on that stream for about seven years; that is, the measurements for the Geological
3971 Survey, during a portion of the time, at the State line, at Pueblo, La Junta, Lamar,—that is, the Colorado-and-Kansas line—and then under my direction for the last two or three years measurements have been kept up at Syracuse and—I don't remember now just where they are at the present time in Kansas. They are reported to my office but I have not paid any particular attention to them. That is, only for the last two or three years they have come directly to me. It is only for the last two or three years that I have had any measurements, even by others, within the State of Kansas. I have made a few trips to Coolidge, Kansas, about four or five years ago, but never found any water to measure at any time I was there. No, I have not been down there to make any effort to find water to measure during the last year. I have had men down there, but I have not their reports and do not know what they are. I know it as a matter of reports received at the office that there has been a good deal of water in the Arkansas river in eastern
3972 Colorado and western Kansas during the last year. I am acquainted with Senator Swink at Rocky Ford and have a very high regard for him as an irrigator of practical experience, and if he has testified in this case that he believed the flow of water in the Arkansas river in western Kansas had increased of late years, particularly during the dry season, and that on the strength of that fact he and his associates have invested a large amount of money in the purchase of the Great Eastern ditch, I would say that I have qualified all of my answers, I think, by saying that the total flow I believe to have been materially decreased. Now, I am of the opinion that the extreme low water stages have been increased; that is, that there is more water passing down the river at what would ordinarily be the extreme low water stages of the river at the Kansas line, but not as regards the total flow. If Senator Swink had made a personal investigation of that matter from time to time

for a number of years last past, I should give his opinion a great deal of weight.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

If forty or fifty witnesses who have lived on the banks of the river in the State of Kansas from fifteen to thirty years continuously have testified in this case that the total flow of the river has been materially decreased since irrigation has been carried on in Colorado, my judgment would be in conformity with theirs. (Objection by defendants.)

3975 WALTER B. DUNTON, Denver, Colorado.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I have resided at Rock Springs, Wyoming, for about eight months. I was employed for about two years by the irrigation investigation division of the Department of Agriculture at Washington, entering that employ in September, 1902, and remaining until May, 1904. In the prosecution of my work while so connected I made an examination of the North Platte and its tributaries, the South Platte and the main Platte in Colorado, Wyoming and Nebraska. I visited all the county seats where the records of decrees were kept for the South Platte and North Platte rivers—in Colorado the State engineer's office, the State engineer's office in Wyoming and
3976 the State engineer's office at Lincoln, Nebraska. In respect to the South Platte in Nebraska, as regards appropriations from the stream in that State, I looked at the original adjudication of the Nebraska State board of control held in 1898 and it showed that there were eight small ditches with priorities of 1894 and 1895 which were awarded appropriations from that river. From a memorandum which I have I can state that there was an appropriation by the ditches of 82.26 cubic feet in 1894 and 29.14 cubic feet per second in 1895, making a total of 112 second-feet. As to the appropriations from the South Platte in the State of Colorado, subsequent to these appropriations of 1894 and 1895 there have been about 1,900 second-feet appropriated from the South Platte in Colorado with priorities subsequent to 1895. These have been decreed priorities. There may have been some ditches that appropriated water that
3977 have no decreed rights. I can only give accurately the date of one priority from the Laramie river in Wyoming, which was awarded to the Wheatland Development Company for 38,000 acres in 1883. There have been a large number of appropriations from the Laramie river in Wyoming. It is over-appropriated. There have been about 550 second-feet decreed from the Laramie

river in Colorado, with appropriations subsequent to 1883. Of this amount 400 second-feet were decreed to what is known as the Skyline ditch with a priority of 1891. The Skyline ditch divides the water and turns it over into another water shed, bringing it down into the Cache la Poudre. The appropriation of the Skyline
3978 dates from 1891. It probably takes about 150 second-feet. It was decreed 400 second-feet for direct irrigation and also five hundred million cubic feet for storage. The ditches now in course of construction or which have been constructed during the past year, together with the previous ditches, will take about seventy-five to ninety per cent. of the flow of the Laramie in Colorado. If these subsequent appropriators in Colorado should be permitted to take that water it would very seriously injure the land now irrigated in Wyoming by prior appropriation there. If only twenty-five per cent. of the water of the Laramie river should pass the State line into Wyoming it would undoubtedly put some of them in Wyoming out of business. Of course there are larger tributaries which come into the stream in Wyoming and which cannot be touched
3979 by diversions in Colorado. Yes, there are appropriations in Colorado subsequent to appropriations in Wyoming which would practically take seventy-five per cent. of the water before it reaches the State line dividing Colorado from Wyoming. The Skyline is one of these ditches, and is completed. Two ditches, one of them called the Bob Creek and the other one the Nun Creek ditch, are designed with the same end in view—to convey the water over the water shed. I understand the Nun Creek ditch has been built since I was there, but I do not know only from hearsay.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

The appropriations in Colorado from the Laramie river that have already been made and made subsequently to prior appropriations in Wyoming will take from seventy-five to ninety per cent. of that river at the State line in the summer season and when the water is most valuable and most needed. The effect of taking sev-
3980 enty-five to ninety per cent. of the flow of the river during the summer season in the State of Colorado would diminish the Laramie river to that extent in its flow at the Wyoming State line. These appropriations that are taken in Colorado being taken into another water shed, no seepage whatever gets back into the river and flows down into Wyoming, and what is taken in Colorado is a total loss to Wyoming. There is a good deal of complaint in the State of Wyoming as to the subsequent appropriations
3981 in the State of Colorado. (Objection by defendants.) A suit is now pending involving the appropriations on Sand creek, one of the tributaries of the Laramie. (Objection by defendants.) As to the extent to which the waters of the South Platte have been appropriated in the State of Colorado for irrigation, I will say there

is practically no water at all flowing across the State line during the summer season. It is only in the winter time and times of very unusual floods that there is any water at all flowing in the river at the State line. It is a dry bed of sand. You might say that the total flow of the South Platte river has been appropriated in the State of Colorado, and there is practically no water at all in the summer season during July and August at the State line. This total
3982 loss of water at the State line is caused by the diversion of water for irrigation purposes above that point. In the course of making this report I looked up the records of the stream as carefully as possible although there had never been any records of the flow of the stream kept at the State line except within the last year or two, and I also interviewed a large number of old-timers who were acquainted with the flow of the stream in the early days before any ditches were taken out to amount to anything, and their testimony was unanimous in saying that in those days and usually during the dry part of the season the stream would be dry or there would be only a little water trickling in channels at the State line, but the water used to flow there in considerable volume during the flood season where none flows at all now. (Objection by defendants.) I collected this information in my service for the Government and as a part of my duties. From my in-
3983 formation the time when the period of low water manifested itself in early years is extended over a much longer period now than it was in the early days when no diversions were made from the river. It is my judgment that the flow of the river has been materially diminished because of the taking of water in Colorado. The bed of the river, particularly from the mouth of the Poudre down to the State line, a distance of approximately 150 miles, is very sandy and is very broad.

From my information and observation, there was such a
3984 thing known along the South Platte river as a June rise, and according to that testimony the usual spring floods used to occur, but now these springs floods do not occur, on account, in my opinion, of the use of the water for storage and for large ditches along the South Platte.

Along this river you always find water by digging a hole in the bed of the sand, and I suppose that "underflow" is the popular term for the water which is found in the bed of the stream. I made no examination to determine the velocity of that underflow. I know that you can dig a hole in the bed of the stream and find
3985 water when the bed of the river is dry. It is my opinion that every diversion of water from the stream for irrigation diminishes the flow of that stream, and naturally, if you took every drop of water out of it it would diminish the amount of water in the so-called underflow which would appear in the stream a number of miles below. (Objection by defendants.)

The South Platte river has its rise in South park, on the eastern slope of the Rocky mountains. There are a number of tributaries,

such as the Cache la Poudre, which is a larger stream than the Platte itself. The source of the underflow is like all of those
3986 western streams—the snow in the mountains forms the principal supply. On the South Platte in Colorado undoubtedly the entire flow was fully appropriated for direct irrigation by ditches with priorities prior to any ditch ever taken out in Nebraska. I do not think that any appropriation made now with subsequent priorities to those already secured could affect the flow of the stream at the State line unless they should discover some reservoir sites down near the State line and store water there, what little might get past. There may be some surplus flow of water in the stream now.
3987 The normal flow is exhausted. I stated that between 900 and 1,000 cubic feet per second had been appropriated subsequently to 1895 in Colorado, but these ditches never got any water except in times of unusual flood, because the prior ditches in Colorado were sufficient to prevent these later ones from getting any water excepting in flood times.

There is a great deal of difficulty between different water districts or divisions in Colorado. A decree of one district would not be binding upon the appropriators in another district, but they would be binding upon the appropriators themselves in the district for
3988 which the decree was given. The claim is made by the up-stream district that the decree for the down-stream district was fraudulent and fictitious and on that ground they got their injunction, and the effect of the injunction is to prevent any water from being let down, and even though the suit is not maintained and the injunction finally made perpetual it is generally possible to keep the suit going long enough until the stream falls again. A subsequent appropriator may institute a suit when the water is coming and enjoin the water commissioner from supplying that water to a ditch with a prior appropriation and keep the suit pending long enough to get the water regardless of the determination of the suit, and that has been demonstrated to be possible and it has
3989 been done. There is litigation of this kind now pending, or it was pending last spring, between appropriators in district 67 and district 3 on that same question.

The stream is largely over-appropriated in every district in the late season in Colorado, and they get every drop of water they can out of it, and the effect of this is that there is nothing but a dry bed of sand from Julesburg to the junction, which I should roughly guess is about a hundred miles, and the effect of this reduction is that there is no water that flows across there at all.

3990 I stated in my direct examination the effect of Colorado taking all of the water of the Laramie river and that it would injuriously affect the irrigation of the Wheatland system.

3991 As to the percentage of waters used for irrigation that return as seepage to the stream, that depends entirely upon the character of the soil, the distance to which the water is taken and the use that is made of it. There is probably an average of one-

third of the water diverted seeps back into the river. If these diversions should be repeated over and over as you go on down the
3992 river, undoubtedly it would be possible to divert the entire body. Of course in times of flood that is another thing. The only seepage water that would go on down the stream so as to be a part of the flow would be the seepage from the ditches lowest down. The seepage water to get back into Nebraska so as to affect the flow in that State must come into the river below the headgate of the lowest ditch, if the lowest headgate is taking all of the water in the stream. When the lowest headgate is taking all of the water in the stream the seepage that will get back into the river so as to affect the flow of the river below must be below that headgate.

3993 The North Platte and the South Platte differ very largely. The Arkansas river, so far as I am acquainted with it, is quite similar to the South Platte after it gets down into Nebraska where it spreads out along the sands.

Cross-examination on behalf of defendants.

By Mr. HAYT:

3994 I am an attorney at law, practicing at Rock Springs, Wyoming. I have been there for about eight months. I was admitted to the bar in 1899, and am twenty-eight years of age. I am a native of Vermont and came west first in 1902. I made no study of irrigation prior to coming west, but I have practically done nothing else since that time until this summer—that is, than to study the law and also the practice of irrigation. I was working for the irrigation investigation of the Government. I did not do
3995 anything else. I had no knowledge of irrigation at the time of my appointment, and I was appointed at the time of com-
3996 ing here, in 1902. The couple of weeks after my appointment and before coming here I devoted to work in the Congressional Library, looking up the records of early explorers, like Fremont. After coming here Professor Mead in his report wished to show the various decreed rights on the South Platte, the North Platte and the main Platte, and that was my particular duty.
3997 I spent a couple of months on a trip taking seepage measurements and things of that kind, and assisted in the general work of the office. I suppose in actually looking over the decrees and finding the basis on which they were made I might have spent five or six months. I found these decrees in the offices of the state engineers in Wyoming and Nebraska, but in Colorado I visited the county seats to look over the referees' findings in those matters. I visited Sterling, Greeley, Fort Collins, Boulder, Denver, Castle Rock, Fairplay and Golden in 1903.

3998 I was along the North Platte in 1902, but I think I was not along the South Platte in that year. My visit along the North Platte was in the last part of October or first part of November, and I was on that part of the river from Fort Laramie

down to the State line. I was not on the North Platte in 1902; it was in 1903; and I was along the North Platte from about the first of August to the last of September, 1903, from the State line of Colorado to the State line of Nebraska. I was making seepage measurements from the point where the stream crosses the Colorado-and-Wyoming line, down to the point where it crosses the Nebraska-and-Wyoming line. I made those seepage measurements by getting the flow of the river and measuring it by the current meter in each case, measuring the flow at a given point above the headgate of a ditch and measuring the amount of diversions and also the amounts coming in from tributaries, and then the amounts, say, ten or twelve miles below, differing in different cases.

3999 I concluded that work on the North Platte about the middle of September or first of October, 1903. I then went down to Lincoln, Nebraska, to get the decrees in the State engineers' office. I had been along the South Platte river in the spring of 1903 during the month of July and during the month of June. I was along the South Platte making this investigation, I think, from the middle of May to the last of July, and also in the winter months. I was along all parts of the river from the mouth of the cañon down to the State line. I camped on the river. We generally took the railroad and stopped off at a point and then would ride down the stream.

4000 I think I came here to Denver for two or three weeks in October. I was on the North Platte until about the first of that month, and after I came here I think I went down to Lincoln. I was on the South Platte in Colorado in the fall of 1903, not more than two or three weeks, and that was along about Sterling. I was here in April, 1904, here at Denver and Greeley, on the Poudre and South Platte. That was the sole time I was on these streams in 1904, and I was not here for more than a week or two. I

4001 think I rode out along the stream from Denver. I rode out down to Irondale, about nine or ten miles below Denver. I made no other personal investigation along these streams in 1904. I was no longer in the service of the Government. I quit the service about the first of May that year, I think. I entered the service about the 15th of September, 1902. I was making these investigations, did this work in Washington and examined these decrees, I think, in the time extending from the middle of September, 1902, to the first of May, 1904, and I made no previous preparation, either by studying the question of irrigation or in the line of civil

4002 engineering, for this work. At the State line the taking of water from the Platte river in Colorado has undoubtedly decreased the flow of the river except in very dry seasons when possibly no water ever flows there. If Mr. Van Orsdel and Mr. Corthell testified that they had been acquainted with the Platte river for the past fifteen years and that there was no perceptible diminution in the flow of the river below the junction of the South Platte with the North Platte, of course, as I have no personal knowledge on the subject, from all I could learn, during the past fifteen years there has

never been any water flowing at the junction as those gentlemen stated, only when some unusual flood might come along.

4003 I don't think there has been any diminution of the flow myself. I think the parties whom I interviewed were unanimous in saying there had been no diminution in the flow at the junction of those streams during the past fifteen years. I understood your question to be, Have these appropriations in Colorado diminished the flow of the stream at the State line? That is, if there were no diversions in Colorado at all at the present time would there be more water flowing at the State line than there is now? And I certainly think there would be. Such was the testimony of those gentlemen whom I interviewed. I do not think there was anything to diminish except occasional flood waters beyond the junction during the last fifteen years. Of course the North

4004 Platte always carries some water. I know the seepage flow at the State line is greater in October and November and the winter months than at any other time, but I have no knowl-

4005 edge that they had quite a stream of water there. I understand that the South Platte river does carry water at the State line and below the State line during the fall months of the year. I stated, yes sir, that in my opinion there is no water at the ordinary stages for the supply of irrigation ditches in Nebraska after the priorities in Colorado are supplied which are earlier than

4006 those in Nebraska. I think there is something like 175 miles of the Laramie river in the State of Wyoming, and, roughly estimating it, forty or fifty in Colorado, and that the drainage area of the Laramie river in Wyoming is much larger than the

4007 drainage of the Laramie river in Colorado. I should say there was five times as much, or perhaps greater. I don't know. I have stated that if the ditches already constructed should take seventy-five per cent. and another ditch would take twenty-five per cent., if it were constructed, it would naturally take all the water in the stream. I do not think that would be possible, though. I think the physical obstacles are such that, while I have never made any engineering examination of it, it could not possibly exhaust every drop of water flowing across the State line, but they could

4008 very seriously diminish the flow, as they do at present. I was on the South Platte river at the State line in June, 1903, when there was no water. I was there in the fall when there was no

4009 water, about the first of October, 1903. I was not directly at the State line at any other times besides these, but I was at Sterling in July when there was little water at Sterling, so little that I do not think there could have been any at the State line. I also saw the records of flow which were kept during that year at Julesburg by the Geological Survey. Sterling is about twenty-five or thirty miles from the State line, and Julesburg is right at the State line. I made no investigation of the underflow. I saw a ditch

4010 diverting water from the main Platte down near Lexington at which the manager dug a trench across the river and he

got several cubic feet per second by his trench dug in the bed of the river. He dug it in the spring of 1903. It was taken from there. I couldn't say where the water came from. Undoubtedly the seepage does increase. If there were no seepage from ditches in district 64 during the summer season it would be in a bad way. Of
4011 course seepage does help them out. It is the universal opinion that the seepage furnished the greater supply for the ditches in eastern Colorado at the time I was there. I supposethe water in the bed of the stream, whether it is found beneath or above the surface, comes from practically the same source as that of all those western streams. Of course drainage amounts to something, and rainfall helps the flow of the stream. You take the South Platte and of course where it leaves the Platte cañon up here that ends its flow through the mountains. The tributaries which enter it are some of them more important streams than the South Platte, like the Cache la Poudre. I should not say, myself, that the drainage area of the South Platte is larger outside of the mountains
4012 than the drainage area in the mountains. You take two experts and the way they will define the drainage area of a certain stream differs very largely. I understand the drainage area to be that portion of the country which slopes toward that particular stream.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4014 The year 1904 has been called a very wet year, or a pretty good year, yes sir. The seepage in the eastern district of Colorado on the South Platte river is about all the water they get when it is so computed in the summer season. Their ditches have a capacity to take all of that seepage water, so that it does not allow any to flow on down below.

SANTA FE, NEW MEXICO, January 31–February 1, 1905.

4016 MIGUEL A. OTERO, Santa Fe, New Mexico.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside in Santa Fe, New Mexico, and have been governor of the Territory nearly eight years. I have resided in the Territory since 1879, but have lived in the Territory off and on for nearly
4017 forty-six years. I have been over the Territory considerably, and am well acquainted with its resources, its property and its people.

Less exemptions, the assessed valuation of property in the Territory is in the neighborhood of forty-one millions. This is about

one-fifth of the real value. A great deal of the Territory is exempt on account of a two hundred dollar exemption for heads of families.

I should judge that about two-thirds of the property in New Mexico has been created by irrigation. Probably more. That is, figuring directly and indirectly. I should say at least that
4018 much. This two-thirds of the total valuation of property in New Mexico could not have been created and would not now be existing if we were obliged to let the water run in the streams undiminished and unaffected in any way.

In my judgment not all the lands which can be reclaimed in New Mexico have already been reclaimed, considering the water in our streams. I should say that between two and three million acres could yet be reclaimed. This is a conservative estimate.
4019 Should this land be reclaimed I should judge it would be worth from $25 to $100 and even as high as $250 an acre, depending of course, on the location and the opportunities to market the products. A good deal of this land is Government land—four-fifths of it, or even more perhaps. It is now worth from forty cents to $1.25 an acre. A great deal of it I would not give twenty-five cents an acre for. If they put 3,000,000 acres of land under water here I think it would support over a million people, consid-
4020 erably over that, in this Territory.

The custom with respect to using the waters of the streams in this Territory for years has been to take the waters from the streams and apply them to the lands for the purpose of raising crops. This usage or custom antedated any legislation on the subject. It is a matter of common and historical knowledge. I testified before the Committee on Foreign Affairs in Washington at the time I went there to oppose the international dam, that irrigation had been carried on here between two and three hundred years ago. From common knowledge I think it is a fact that the first appropriations were taken out of the Rio Grande. They are between two and three hundred years old. Recent appropriations from the Rio Grande in Colorado have affected the appropriations in New Mexico below the State line. (Objection by defendants.)

4021 Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

Such diversions in Colorado have affected the flow of the river by taking the water out of the streams that run into this Territory here, and have often had the Rio Grande dry as far as Albuquerque; that is, the water could not get down any farther than that. (Objection by defendants.) As to what has dried the Rio Grande as far as Albuquerque, I would not like to state, because I do not know positively, but from my information from engineers it is that the waters were taken out in the San Luis valley up there in Colorado.
4022 (Objection by defendants.) The irrigation that produced this effect was located in Colorado. If the Colorado doctrine, that

she has the right to take all of the water that flows in the streams within her borders, should prevail, and if she should take it, it would be absolutely ruinous to us down here in New Mexico. If she should take all of the waters that rise in the State of Colorado and keep them up there it would cut out many streams that flow into New Mexico here, and I think there would be considerable com-
4023 plaint. The streams that rise in Colorado and flow into New Mexico are the La Plate, the Animas, the San Juan and the Rio Grande. Of course there may be other small streams. I have no information as to the normal flow of those streams across the State line, but at least it is considerable, and if that water should be controlled under the Colorado claim and diverted in the State of Colorado it would affect our interests in New Mexico to a very large extent. It would indeed. (Objection by defendants.)

Cross-examination on behalf of defendants.

By Mr. DAWSON:

I think the irrigated lands along the rivers in New Mexico are as valuable to day as at any time since I have known them.
4024 The lands are not losing in value at this time in New Mexico under the present conditions existing in Colorado, only so much as they cannot be used for lack of water. The lands are just as valuable for living. I think as a matter of fact the prices for such lands as are under ditches on the Rio Grande are now less than you could have bought them at fifteen or twenty years ago. You cannot get the prices on the Rio Grande for lands now, on account of the water,—you cannot get as much as those lands near Peralta, Los Lunas and other sections in the Rio Grande valley. The Rio Grande did not have any water at all in it from El Paso to Albuquerque, and it is getting drier nearly every season, and this did not
4025 occur until late years. My recollection of the Rio Grande in years gone by is that it was flowing all the time.

I don't know whether the timber has been extensively cut and burned on the headwaters of the Rio Grande and its tributaries or not. I know that wherever lands are irrigated there is a certain percentage of return flow or return waters to the streams, and if large amounts of water are taken out and spread over the land in the early part of the year when there is ample water it will tend to equalize the flow of the stream during the other months of the year by reason of the return flow, if they turn it back into the stream. If they use the water and turn it off onto prairie land or a large area of country there would not be very much of it returned to the stream. I would say a great deal of the water used to-day for irrigation returns in seepage water if the drainage is toward the stream, even though it goes into the soil.

The establishment of a doctrine which would prevent the taking of water from the streams for irrigation would be absolutely
4026 ruinous to New Mexico, if enforced; and I believe that would be true of all the arid region, in nearly all the Territories and

States where irrigation is a necessity for the cultivation of the land. I should say that lands in New Mexico that are now under irrigation with an ample supply of water are worth on an average from $25 to $100 and as high as $250 an acre; in fact I have known lands in the Pecos valley to sell as high as $500 an acre. I think $25 to $50 would be a very conservative figure. And if these same lands would be deprived of water I should say the value would be about forty cents to $1.25 per acre. If they were deprived of that water they would go back to about these prices.

4027 I lived at Granada, Kansas, in 1873, and until 1875, and went up to La Junta. I have frequently gone hunting in those years along the Arkansas river, and I have walked across it frequently there without wetting my shoes. I have hunted ducks in that country over toward Holly and below and at La Junta also. Of course in flood seasons you could not swim a horse across sometimes. I have walked across it several times—frequently.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

When I walked across the river at Granada it was during the dry season of the year.

Taking the water in Colorado out of the Rio Grande has seriously interfered with the flow of that stream in the last ten or fif-
4028 teen years. To what extent, you would have to ask an engineer. I would not be prepared to answer that. (Objection by defendants.) It has, however, reduced it to such an extent that at certain times of the year there is no flow in the river below Albuquerque, and from my experience it never had been that low prior to the time irrigation was put in force in Colorado. I believe that, regardless of local pride for my own Territory, we have one of the finest climates in the world and our irrigable lands along the streams in this Territory are rich lands and can be raised to
4029 a very high state of cultivation, and the success of our Territory will depend very largely on the methods pursued by the Government, the States and parties with respect to irrigation.

4030 LUTHER FOSTER, Santa Fe, New Mexico.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside at Los Lunas and am president of the Agricultural College of New Mexico and director of the agricultural experiment station for the United States Government. I have been connected with the agricultural experiment station in this Territory for three years, and in other States ever since its organization in 1887. I have been at Los Lunas three years last November. For fourteen

months previous to coming to New Mexico I was connected with the agricultural experiment station in Wyoming at Laramie, and for four years previous to that was director of the experiment station of Utah at Logan; and for three years previous to that I was connected with the Montana agricultural experiment station.

4031 In all these places there were agricultural colleges. At Laramie in Wyoming the agricultural college and experiment station is a department of the university. I was professor of agriculture and vice-director of the experiment station there. In all of these institutions it was necessary for me to study the question of irrigation, and that was one of the leading lines of investigation. In the arid region I think that irrigation is really only in its beginning. Since coming to New Mexico I have been around over the Territory to some extent and have made observations with respect to what irrigation has done here. I have been through the Pecos valley, and on those trips I have made have stopped at most

4032 of the principal places for a day. I have been also up and down the Rio Grande and at other places along the Rock Island railroad, also at places west of Albuquerque, and pretty well over the Territory, except in the San Juan country in the northwest corner.

I should say that the whole property of New Mexico is dependent largely upon irrigation. I should say more than half. If you put out the stock interests I would say seventy-five or eighty per cent. of it. I mean the stock interests that simply depend on the range. If all the waters were conserved I believe that somewhere from six to eight million acres might yet be reclaimed in New Mex-

4033 ico. I think that land in general is worth from nothing to perhaps $1.50 an acre. Some of it might be worth more. If water could be applied to this land, judging the price of farm products as they have existed in the Territory since I have been here, every acre would be worth a hundred dollars, and from that

4034 up, if you count fifteen per cent. a good return for an investment of that kind. To be conservative, I would say a forty-acre tract of land would easily support a family of six, and I believe you could put it inside of that considerably. Directly, I mean. That is, those that go on the land and cultivate it. The lands between Albuquerque and El Paso are practically all irrigated

4035 lands, that is, those that produce crops. It is not possible along the Rio Grande to produce an agricultuaal crop, or any place in New Mexico, by depending upon rainfall. I think there are a few places in the White and Azure mountains where there is rainfall enough to produce small grains, but there is no great extent of land of that kind.

Between Albuquerque and the State line dividing New Mexico from Texas there are the following towns: Los Lunas, Belen, Socorro, San Antonio, San Marcial, Engle, Rincon, Dona Ana, Las Cruces, Mesilla Park, Earlham and Anthony. These towns are

supported by crops produced on the land. Of course some of them are supported also by the mining interests and stock raising.

4036 A very large percentage of the population on the Rio Grande from Albuquerque to the New Mexico-Texas line depends very largely upon the lands which are dependent upon crops raised by irrigation. If the people along the Rio Grande were compelled to allow the water to run down undiminished and unaffected the property along the stream would be deserted. If the water was taken out above Albuquerque the property between Albuquerque and the points named would be deserted and would be worth-

4037 less, a very large percentage of it. I have been in the Pecos valley and I do not believe they are irrigating and cultivating all the lands that can be irrigated and cultivated there. Under what we would call intelligent agriculture, with economical use of the water, I am very conservative in saying that the area could be doubled there provided they would take care of the flood waters, and of course by taking care of the flood waters, many more times. I think I could say the same things with respect to the Rio Grande, with the water that runs down now. Perhaps it is not so apparent on this river, but I think it could be doubled, yes sir, with a proper use of the water. That is only an opinion.

I know there is an old ditch down in our valley that is said to be three hundred years old, and there is evidence to show it is a very old one. It was along an old river bed, the Rio Grande having changed its bed since that canal was built, and then by the

4038 growth on it, by the mesquite and darnel that grows on it I would judge it to be very old. I have not cut these trees to see the growth, but I presume it is in the neighborhood of two hundred years old, and may be three hundred. The common understanding in this Territory is that that ditch was constructed about three hundred years ago.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

As to how large the Rio Grande is, I cannot state as to cubic feet per second of time. Sometimes it is a very large river. At times and in places it is a mile wide and at other times there is no river at all. Where there is no river at all, according to my personal knowledge, is from El Paso up above Rincon to Garfield. Along there I have driven right in the bottom of the river for two or three miles at a stretch. I suppose that irrigation through the

4039 Territory has had an effect in reducing the flow of the river. The San Luis valley is said to be a very highly irrigated valley at the present time, using a great deal of water. As to the effect that irrigation in Colorado has had upon the flow of the Rio Grande, it is the general understanding among our people that on

account of this irrigation in Colorado we are short of water,
4040 and that is the reason why the Rio Grande goes dry during our crop season. (Objection by defendants.) It is my understanding that the Rio Grande has gone dry only since the irrigation on the upper reaches of the Rio Grande. (Objection by defendants.) This understanding comes from what is said by people generally in this Territory up and down the valley. If the State of Colorado should prevail in her claim that she has the right by virtue of her constitution and laws to take all of the waters of the
4041 streams which rise within her borders and that flow into this Territory, it would very largely destroy our agricultural interests. The streams that rise in Colorado and flow into New Mexico are the Rio Grande, the San Juan and its tributaries and the La Plata. There are some others, but I believe these are the principal ones. If a just control could be exercised over those streams and the waters of those streams could be properly conserved, and especially the flood waters could be impounded, it would have a very beneficial effect on the agricultural interests of our Territory and would largely increase them. I
4042 think this would increase the irrigable lands at least 2,000,000 acres (objection by defendants); that is, counting that that has once been under irrigation but is now deprived of water, which is quite a large area along the Rio Grande. The lands that were formerly irrigated along the Rio Grande and that are not now under irrigation have become so because of lack of water. (Objec-
4043 tion by defendants.) The cause of the lack of water has been the diminution of water in the Rio Grande. (Objection by defendants.) The general understanding is that this is caused by the water being taken out farther up the river in the State of Colorado. (Objection by defendants.) This is a matter of common knowledge in this Territory. That is the understanding.

The climate in this Territory is exceedingly healthful and delightful and our lands when water is applied are very rich,
4044 productive and fertile.

If the United States Government should pursue the policy that is now outlined under the reclamation act of 1902 a large development of very useful and highly cultivated land in this Territory would result. This policy is not only a wise one but an exceedingly practicable one. I believe the impounding of water is a practicable project. If the Colorado claim should prevail and no water be allowed to cross the State line into this Territory it would certainly interfere with this reclamation of our lands and the impounding of waters in our Territory. (Objection by defendants.)

Cross-examination on behalf of defendants.

By Mr. DAWSON:

4045 I have never been on the Rio Grande in Colorado. I may have crossed it on the train, but not to my knowledge. I

don't know what the conditions of rainfall and snow fall have been on the headquarters of the Rio Grande for the last ten or fifteen years as compared with any earlier period, and I don't know it to be a fact that the timber has been largely cut and burned off on the headwaters of the Rio Grande and its tributaries within that time. I have heard that such was the case, and from my experience in charge of experimental stations and otherwise
4046 I know that the timber on the sources of a stream is a great conservator of the water supply, and I know that where the headwaters of a stream are densely timbered the snows lies later in the season and go off more gradually and furnish a more permanent river than where the ground has been stripped of its timber, and as far as my personal knowledge goes it might and it might not be true that the difference in the flow of the Rio Grande in New Mexico had been largely caused by the cutting and burning of the timber, and the eating off of the undergrowth and grass which was the natural covering of the soil. I don't know personally that there are any sites for storage reservoirs that are practicable on the Rio Grande and its tributaries in Colorado. There are times, even through New Mexico, when the Rio Grande carries much more water than it used to. I don't know of any reason why the people in New Mexico or the Federal Government for their benefit should not store these waste or surplus waters that run through the Territory of New Mexico as well as insisting that the Colorado irrigators permit the water to come down from Colorado at times when they need it there. The dry months or weeks of the year on the Rio Grande vary. Usually in these three years I have been here the Rio Grande has gone dry some time in April, but last year in March. The year before it was in April, and I think the
4047 year before it was never entirely dry. Yes, it was, a little later, and it stayed dry until July when the summer rains began. I don't know when they do the irrigating up in the San Luis valley, but my experience in regard to the elevation there and the crops raised would lead me to believe it is not done as early as March. Certainly not. If the irrigation is not done up there in March then that could not account for the dryness in the
4048 river here in March, but I presume for April and May and June it might. The river is most apt to go dry from Rincon, forty miles above Las Cruces, to El Paso. Rincon is in the neighborhood of 275 to 300 miles from the Colorado-New Mexico line, and along the river it is about seventy miles from the Texas line. I think that a great deal of the way—although I don't know definitely—from the Colorado-New Mexico line to Rincon the Rio Grande is drawn upon for irrigation, except from Albuquerque down. It is my understanding that this part of the Rio Grande in New Mexico is used for irrigation, and there is no doubt but what the use of this water for irrigation for a distance of 275 miles from the Colorado line to Rincon would have something to do with the dryness of the river between Rincon and the New Mexico-Texas line.

4049 I know from observation and experience that there is such a thing as return or seepage waters from irrigation. The character of the soil has something to do with the seepage water returned from irrigated lands in the same water shed. The general rule is that it is from one-fourth to one-third. I think along the Rio Grande where I am most familiar with it it would not amount to more than one-eighth, because of the sub-soil being adobe, but where it is loose, porous soil or a fairly open sub-soil it would reach maybe one-quarter to one-third. In this climate where evaporation is so great the adobe soil would hold the water and it would evaporate before it would ever go down. We made some investigation to find out that it never did go down really in some of the stiff
4050 adobe soil. It is true to some extent that the taking out of the water in large quantities and distributing it over the soil at a time when the flow of a stream is sufficient has a tendency to maintain the flow at a later period when the river would naturally be low.

The lands in Colorado and New Mexico farmed by irrigation are much more productive than in non-irrigated countries. It will support a larger population for a given area. To a large extent in New Mexico, on account of the other industries depending upon irrigated agriculture, if that were done away with it would depopulate the Territory. I think the lands along the Rio Grande which could be irrigated from the waters of that stream as they exist now without storage could be practically doubled by a proper handling
4051 of the water—that is, by intelligent agriculture. While the methods used in the Territory are primitive, I do not think they are any more wasteful than in any other sections of the country I have lived in. I have found that where a man has plenty of water that he can have as his own he is wasteful of it, and that is true in New Mexico as well as in any other place I have lived in. The general tendency is to use more water than is necessary to produce a crop. All of the irrigation in the arid district is in its infancy to day and by improved methods more land could be irrigated and larger crops could be raised with the same amount of water. It is true that lands irrigated for a considerable length of time will need less water than when first irrigated. That is the gen-
4052 eral experience. It is true that a stream flowing through this country from the mountains, even when none is taken out for irrigation, would diminish to a certain amount. The surface flow will grow less if it has no tributaries.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

I do not think the people are more wasteful in the use of water for irrigation in New Mexico than in Colorado under similar
4053 conditions. (Objection by defendants.) I do not think that the more water you take for irrigation from a river the more there is in the river. That is not true, no sir.

The denuding of the forests affects the time and rapidity
4054 with which the snows go off.

The years 1902 and 1903 and the early part of 1904 have been very dry years through this Territory.

Recross-examination on behalf of defendants.

By Mr. DAWSON:

If we should take a hypothetical case and say that 10,000 cubic feet of water per second of time could be taken out of a stream during the flush season and be spread upon the land and through seepage returned to the stream during the dry season where
4055 there was only 500 cubic feet per second of time flowing, and twenty-five per cent. of the water used for irrigation should return in seepage, then certainly the stream would be increased to that amount.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

Not taking a hypothetical case but an actual one, and supposing that the Arkansas river at Pueblo is shown during the last sixteen years to have had an average flow of 750 cubic feet per second of time, and supposing that a dozen ditches are taken out between Pueblo and the Kansas-Colorado State line, many of them large enough to take the whole flow of the river, and that none of them have any reservoirs and that all take all they can get during the dry season of the year, it would certainly use up all the water in the stream. (Objection by defendants.)

4057 M. W. MILLS, Santa Fe, New Mexico.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

My residence is located in Colfax county, in the northeastern portion of the Territory, fifty miles from the Colorado line, about. I have resided there since 1869. I am a practicing attorney. I have also been engaged since coming to the Territory of New Mexico in raising fruit, and I have a cow ranch and a horse ranch, a merchandise department and a law department. I have been engaged in raising crops by irrigation for over thirty years, mostly in Colfax and Mora counties, in New Mexico. Mora county is right south of Colfax county. I have under cultivation 500 acres. I raise alfalfa, corn, oats, wheat, fruits, garden truck, etc. I have about 200 acres of fruit orchard now. I did have about 400.

The rainfall in and around where my ranch is located is not suf-

ficient to raise crops without irrigation. I depend on irriga-
4058 tion to raise crops.

As a lawyer, I know what is known as the doctrine of riparian rights concerning the waters of streams. I read it some time ago. If this doctrine had prevailed in this community I could not have made the development I have spoken of. I am pretty well acquainted with New Mexico, having been here thirty-five years or more. I have travelled all over it, and most of Colorado. I should thin'k about five per cent. of the property in Colfax and Mora counties is created by and dependent upon irrigation. We have a
4059 great deal of railroad in that country, in both counties, also coal mines. The water supply in those counties is very limited. There is no cultivation except along the streams where they can take out water. I am reasonably familiar with the conditions that prevail throughout the Territory of New Mexico. There is only now and then a place here that will produce crops or hay except by irrigation, and these oasis spots are many, many miles apart. The only way in which crops or any agricultural product can be produced is by irrigatian. Now and then a year, perhaps one year in ten, will, perhaps in some favorable situation on the prairie, produce a crop without irrigation.

Not all the lands which can be reclaimed have been reclaimed by irrigation in New Mexico. More lands could be reclaimed by the waters of the streams and by impounding and conserving the flood waters—about one-fourth more than has already been re-
4060 claimed. This matter I have not given much thought to. There couldn't anybody, because you couldn't tell where reservoirs could be made. That is a question very difficult to answer.

There is only one principal stream that I know of that rises in Colorado and flows into New Mexico—the Canadian. Oh, there are several, yes. The Canadian river rises partly in Colorado, and the San Juan partly in Colorado. There have been lands irrigated and reclaimed from the waters of these streams in New Mexico. If the waters of these streams were diverted and used in the State of Colorado these lands in New Mexico would absolutely go back to the condition they were in before water was taken out. (Objection by defendants.)

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4061 I never heard any one advocate the idea of spreading the doctrine of riparian rights over New Mexico.

If the State of Colorado should claim that by virtue of her constitution and laws and her sovereignty as a State she has a right to control all of the water that rises within her borders and should prevail in that claim and should do that, it would affect the Territory

of New Mexico considerably. (Objection by defendants.)
4062 The amount of return water varies under different conditions.
I don't think the return waters along the Rio Grande in New
4063 Mexico would amount to from one-eighth to one-fourth of the
amount diverted. A very small per cent. goes into plant
4064 life. I don't know how much. Five or ten per cent. I
don't believe there would be anything more than about ten
4065 per cent. that goes into evaporation and plant life. Only a
very small proportion of the water that is used for irrigation is absorbed in irrigation. If you turn down a big stream and you have one man irrigating with what we call one head of irrigation—I have irrigated, myself—much more than half of it, unless it goes
a long way in irrigation, goes away again—goes back into
4066 the stream. It don't go into the ground. My condition
there where I irrigate is bed rock below it, and I testify to this
state of facts because it is bed rock and it nearly all goes
4067 back. The Arkansas valley has a sandy bottom and it is
further to bed rock, hence it would naturally run more in the sand and continue along in the sand and not come to the surface so quickly as if the rock or gravel came to the surface, but after a while in my judgment it would all finally get back to the river except the evaporation.

4068 I have known the Rio Grande to go dry in the summer seasons many times. These places exist mostly between Albuquerque—or from about this latitude down. Above that point it always runs water and down through the Rio Grande cañon it has always been a large stream at any time of the year. The portion of the river that we call the Rio Grande cañon begins at Antonito, a little north of the Colorado line, and continues down to a place called Embudo, I suppose eighty or a hundred miles.

There seem to be periods of dry years and periods of wet years. It seems there are periods of more snow fall and periods of more rain, so that I do not think anyone can tell whether the volume is either less or more over a period say of ten years. I suppose that
irrigation along the Rio Grande from the upper portions of it
4069 affects the normal flow of the river, but not perceptibly. I
have crossed it more frequently during the years I have been here, and in the cañon and that place where the river runs you could not discover the difference in the size of the river except in years when it is dry it is less and in years where there is more rain it is more.

I am not one of those who believe that the more water you take out of a stream for irrigation the more flows in the stream. I do not believe that is true, but I think in a big river like the Rio Grande or Arkansas it is not perceptible unless you take out a good deal of it. If you take it absolutely all out for months right along, of course I think there would be less flow, but there would not be such a perceptible difference perhaps, to a casual observer, and there

would not be such a percentage as you have recited here is
4070 given by some professor or somebody who has made those statements.

Cross-examination on behalf of defendants.

By Mr. DAWSON:

4071 I have known the Rio Grande for thirty-one years and have crossed it never less than twice a year in that time, and from
4072 that up to ten times or above that. I do not think there has been any perceptible change in the water that flows in a year through the cañon up there, aside from the variations in these cycles of dry and wet years or some difference that may have occurred by reason of cutting off the timber at the head of the river. When you pass the bridge and pass the cañon the river keeps about the same.

I knew the Arkansas river thirty or thirty-five years ago all along. I first travelled with a stage. I crossed it many times on a stage coach. I commenced to cross it in 1869. I have crossed it in Kansas when it was dry. I have seen it every year more or less. At dry times of the year you would see the Arkansas river dry in places. You could cross it on foot in places every year. That commenced back as early as 1869, and there may have been exceptional years when you could not cross it, but I undertake to say to you that you could cross it every year at some points or in some places.

4073 I have been along the Arkansas river of late years, and I owned land near Hutchinson a year or so ago, but not now. My observation has been that the irrigation of lands in Colorado has not materially affected the flow of the Arkansas river in Kansas, taking it in a cycle of years. As I say, it gets dry. Over a period of some years it is drier than over a period of other years. It seems to depend largely on the rainfall in the rainy season and on the snowfall in the winter season. Those two things control the stream more than any other one thing.

4074 I have never noticed that the taking out of the water and spreading it over the ground in the spring when the stream is running full will help to maintain the stream below that point later in the season when the stream would naturally be low, but naturally I would think so. I would naturally think that when the water used for irrigation is absorbed by the lands adjacent to the river necessarily that runs at a little later period of time, and slowly, of course. If there were 10,000 cubic feet of water running in the Rio Grande in the San Luis valley in Colorado, we will say, in the spring, and that were all taken out and spread over the soil, it would be held back simply to return later and keep up the even size of the stream afterwards. In other words, I think it acts as one system of reservoiring water. I have had lands along the Arkansas river in Kansas within the last thirty years and I have not found that they become less productive or have deteriorated in value by

reason of the use of the water from that river for irrigation in Colorado. The lands have steadily in the last thirty years continued to rise in value all along the river until their value now is five or ten dollars more than it was thirty years ago. (Objection by complainant.)

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4075 I have crossed the bridge at Wichita. I never noticed that the piles upon which the bridge was built were driven down into the river and put below the lowest water mark 4077 ever known. If those piles were put down in a coffer dam dug down under and below extreme low water, and were never seen to protrude above the water until after the year 1890, I would say the indication was that there was less water in the river under those circumstances.

Q. Have they been taking any water to any appreciable extent in the last ten years at Garden City into ditches?

A. Well, at times they have.

Q. Do you say they have been operating those ditches to any extent whatever for the last ten years?

A. Some of them are operated.

Q. Have they been operated now to any extent whatever for the last ten years?

A. Yes sir.

Q. They did operate them from about the year 1880 to 4078 about the year 1887 or 1890, but during the years from about 1890 down to the present time have they been able to get water enough to operate those ditches?

A. I think so.

Q. That is your judgment?

A. That is my judgment.

Q. And that is your information?

A. And that is my information. At times of the year there is plenty of water in the stream all the time. In the spring of the year there is plenty of water and after the rains there is water in the stream. They raise large fields of alfalfa there, and they irrigate about Garden City, and between Garden City and the State line in many places they irrigate now and continue every year more or less.

Q. But to nothing like as great an extent as they did from 1880 to 1890?

A. I am not prepared to say as to the extent, but they do irrigate now and have more or less all the time.

4079 Q. If the parties who have lived there all the time and have been irrigating and operating those ditches when they were in such condition that they could operate them have testified in this

case entirely opposite to that, would it change your judgment at all? Might you be mistaken?

A. A man that had been there all the time observing every day in the month and every day in the year would be able to testify more intelligently than I can by simply visiting it a few times in a year. But I know that the big ditches there are running, and I know there are more farmers there and more irrigation there and more towns there and more agriculture there now than ten years ago.

Q. You do?

A. Yes sir.

Q. You state that as a fact?

A. I state that as a fact.

Q. The towns are larger?

A. Yes sir.

Q. More irrigation?

A. Yes sir.

4080 Q. Do you know that in some of those counties not one-fifth as many acres of alfalfa is now raised as ten years ago? Do you know that is true?

A. No, I don't know that is true.

Q. If the records of those counties introduced in this case show that, you don't know that to be true?

A. I don't know that to be true. I see more of it going on; that is what I testify from, what I see.

Q. And you are giving it simply from your general information that you received when you visited that country?

A. Yes sir.

Q. How often have you visited it in the last ten years?

A. About ten times a year or fifteen times a year.

Q. At Garden City?

A. Well on the train there; I go by every month.

4081 Q. Oh, you just go by on the train?

A. Yes sir.

Q. Did you go by from August, 1903, to May, 1904?

A. Oh, certainly.

Q. And you saw them irrigating?

A. I don't know positively just at that particular period of time. I have no period of time in my recollection; I am just testifying from general memory.

Q. Do you know the population of Finney county in Kansas now?

A. No.

Q. Do you know what the population of Garden City was in 1890?

A. No, I do not.

Q. Do you know that the total population of Finney county now is far less than the population of Garden City alone was in 1890?

A. That may be, and I can account for part of it.

Q. And yet the irrigation is going on, and yet there was not a drop of water in the river from August, 1903, to May, 1904. Is that true?

A. There was a period of time when a lot of people went in there and took up homesteads without irrigation.

4082 Q. But that was long before the irrigation got fully developed, was it not?

A. Well, yes, there was some irrigation going on at that time. Some of them had ditches. A lot of people went in and took up land on the theory that they could raise crops without irrigation on that western arid land, and they found they couldn't and they emigrated. A good many of those people went away. Then afterwards there came in an influx of people who understood the situation better and began to take out water for irrigation, and they have been steadily increasing, in my judgment and according to my observation, ever since.

4084 Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

As used in my testimony, I would call a head of water that which one man appropriates and can use under ordinary circumstances; that which he can work and use on a fair piece of land, etc.

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4085 THOMAS B. CATRON, Santa Fe, New Mexico.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I am an attorney at law, and have resided in the Territory of New Mexico about thirty-eight years. I have been district attorney for the Territory, attorney general, United States attorney, and several times have held the position of member of the lower house and member of the council of the territorial Legislative Assembly. I was also a Delegate in the 54th Congress.

I am familiar with the conditions of New Mexico and its
4086 resources. When I came here New Mexico was very far behind its present State of development. When I came here the people were using water from nearly all the streams in the Territory for irrigation purposes—the Rio Grande, the Pecos and the lateral streams that come in from the mountains. As to how long that has been going on I can only state what I know from the traditions received from the people and from historical facts, that it had continued for over two hundred years previous to the time I came here.

Of the property that has been created since I came here more than one-half of it which now exists has been brought under
4087 a state of cultivation by irrigation. There is not now more than a million and a half acres under irrigation in the Ter-

ritory, in my judgment. I believe that fully fifteen million acres can be brought under irrigation by means of using the unused waters and by properly impounding and conserving the flood waters that we have. No part of this development or reclamation could be brought about under the doctrine of riparian rights. If that doctrine should be invoked and maintained, the progress of the Territory would be absolutely paralyzed so far as development in an agricultural way is concerned. The fifteen million acres which can be reclaimed would when reclaimed be worth from $20 to $50 an acre. It is worth now about ten cents an acre, a great deal of it, and some of it from $1 to $1.25. This land when re-
4088 claimed would support, in my judgment, from two to three millions of people directly.

Q. Now, coming more particularly to the Rio Grande, state whether or not the waters of that stream have been pretty generally appropriated and applied to lands lying along the stream in New Mexico?

(Objection by defendants.)

A. When I came to the Territory the waters of the Rio Grande were used generally along the bottom of the stream clear from the Colorado line or rather I would say from the Taos cañon, which is at La Jolla, south to the line of New Mexico although not to the extent it is used now. There is a great deal of land along the river bottom of the Rio Grande that was then not used and that is used now, but there is quite an amount yet along that bottom that is not being used for agricultural purposes.

4089 Yes, I know that the appropriations along the Rio Grande in New Mexico have been very materially interfered with by the appropriation of the waters in the San Luis valley in Colorado. The flow of water has been very much diminished by the appropriation of water up there. (Objection by defendants.) As to the effect upon the property along the Rio Grande in New Mexico if all the waters above the line dividing the Territory from the State were taken out in the State of Colorado, I will say that in some seasons the water has all been taken out to the line of Colorado, and I crossed the river some years since near the State line of Colorado and

4090 New Mexico and there was not a drop of water flowing across the line. Every year for the last ten or twelve or fifteen years there has been a dearth of water in the Rio Grande, and from Albuquerque or Los Lunas south nearly every year we have had a flow of a sufficient amount of water to insure crops from that down on the lands actually irrigated, and it has been impossible during the last ten years or more to increase the amount of irrigated lands along that river, although there has been quite an amount of land susceptible of irrigation at an insignificant cost. (Objection by defendants.) Of the fifteen million acres of land which can be irrigated at least nine-tenths of it is Government land. If allowed to remain in its present condition it will be worth from ten cents to a

dollar an acre. It is not practicable to make this land profitable and inhabitable without applying the waters of the streams and the flood waters to it, unless you can sink down wells there from which you can pump water at a reasonable rate or which will flow. It has not been shown by experiments that it would be practicable
4091 to sink wells. The only place where they can develop any artesian wells or any wells which could be used successfully is along the Pecos a short distance above Roswell to Little Artesia, a considerable distance below Roswell. There have some wells been developed out in Roosevelt county that they can pump from. It has always been the usage and custom in this Territory prior to any local law on the subject to use the waters of the streams for irrigation purposes. This relates as far back as I have ever heard from tradition or history or in any other way.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

The amount of waters up to the present time has been very limited. I think the probabilities are very good and very strong that you could impound sufficient water to irrigate the fifteen
4092 million acres of land I have mentioned. It was about ten years ago that I saw the Rio Grande dry at the Colorado State line. To the best of my knowledge, I think the greater portion of the San Luis valley in Colorado began to be irrigated something like twenty-five years ago; but there was irrigation in the San Luis valley when I came into the Territory, from the Rio Grande, but that extended up around Alamosa, and beyond there there was very little if any twenty-five years ago and it was generally in small ditches and most of the irrigation at that time was done from mountain streams more than from the Rio Grande. In the last twenty-five years the irrigation in the San Luis valley in Colorado has affected the flow of the Rio Grande in New Mexico, and coming down to within ten years. (Objection by defendants.) The greatest part of those ditches have been so constructed since fifteen years ago (objection by defendants), and I will say that within the last twenty years most all of them have been constructed.
4093 After the flood waters of the spring have run off the construction of those ditches and the use of the water has taken nearly every particle of the water in the Rio Grande down to the line between New Mexico and Colorado. (Objection by defendants.) After you pass that line there is quite a large cañon that extends down probably eighty miles or more and there are some
4094 springs that come into the bottom of that cañon that furnish some water, and when there is plenty of snow in the mountains there are some lateral streams that come in from the mountains that furnish some water, but that is all we get after the flood waters of the spring have run out in the Rio Grande from the line of Colorado down. The taking of the waters of the Rio Grande in Colo-

rado by means of those large ditches has almost destroyed the prior irrigation that had been carried on in the Territory of New Mexico from about the middle of the Territory south. (Objection by defendants.) We generally had every year, almost, enough water to irrigate down to the center of the Territory from north to south. The irrigation that I spoke of that had been destroyed by this appropriation of water above was in existence and had been in existence for a number of years prior to the appropriation of water in
4095 Colorado by those large ditches. (Objection by defendants.) I never heard of any failure of the water of the Rio Grande clear to the southern line of the Territory until they appropriated those waters up there. If the Colorado doctrine, that she has the right under her constitution, her laws and her sovereignty to take and appropriate all the waters that rise within her borders regardless of any conditions below, be carried out, it would retard very much and would practically destroy the prosperity of the southern half of the Territory of New Mexico so far as agriculture is concerned and matters growing out of irrigation. (Objection by defendants.) It is absolutely true that the subsequent appropriation of the waters of the Rio Grande not only injured prior appropriations and irrigation that had already begun and had been carried on in the Territory of New Mexico, but it has also arrested the further development of such irrigation. (Objection by defendants.) If the water
4096 from a large number of the mountain streams which we have and which run off quite an amount of water in the spring time could be impounded we could still go on and develop a good deal of this unappropriated land included within the fifteen millions I have mentioned, but not anywhere near the extent we would be able to do if that doctrine were not carried into effect that you mention as being the Colorado doctrine. I understand that doctrine to be that Colorado has the right or claims the right to appropriate every particle of the water within the limits of the State under her constitutional provision. Should she do that the prosperity of this Territory would be kept back at least one-half or more. In
4097 speaking of this I base my figures entirely on the Rio Grande. I know of but one other stream that rises in Colorado and flows into New Mexico, and that is the Navajo. It is the headwaters of the San Juan river.

I think there has been much less snow fall in the Territory of New Mexico during the last ten or fifteen years than before; but this year there seems to be nearly as much as they had in former times. Last year it was still lighter, and the lightest snow
4098 fall I had ever seen. I will state this, that in some years there is much heavier snow fall than in others, and from about 1893 down for four or five years there was very little change if any in the snow fall. Probably it was greater than in some years previous and less than it was ten or twelve years previous to
4099 that. There has been quite an amount of denuding of the forests. Whether that affected the snow fall or not, the snow

fall since the denuding of the forests does not seem to have been as great nor has it remained on the ground as long. It melted and went off sooner. But whether the amount of snow was affected by the denuding of the forests I do not know, but I judge the melting off was caused to a certain extent by that.

If the Government should carry out the plan indicated by
4100 the reclamation act, disregarding State lines entirely, and impound the water wherever it can be practicably impounded and devote it to the irrigation of these valleys according to their priorities, it would vastly benefit this Territory. I think that policy can be carried out practicably in this Territory.

Cross-examination on behalf of defendants.

By Mr. DAWSON:

In my judgment the reclamation act could not be carried out if the strict riparian doctrine were enforced and that water were to be left in the streams. It could not be carried out in this Territory except in this way—that if it were left in the streams above and allowed to come down to wherever the Government impounded it, wherever they could find reservoir sites to impound it, then it could be carried out regardless of riparian rights down to that point, but if it were allowed to flow clear on through the Territory without being impounded of course the plan of the Government would be inoperative entirely. My judgment is that if the extreme riparian doctrine were enforced throughout the length of the stream,
4101 then the reclamation act must practically fail.

I saw the Rio Grande dry first about twenty years ago as high up as the place called Los Lunas. It has not been dry each year since that time, but the water has been exceedingly low from that point down, and the drouth has often extended above that in some years, depending on the amount of water. The stretch of river in New Mexico most apt to go dry as far as running water on the surface is concerned is from about the center of the Territory south. The center is about 150 miles from the Colorado State line. The principal amount of the water that is flowing in the river from that division line to the center line where it goes dry, the majority
4102 of it, comes from Colorado. About sixty or eighty miles of land from the Colorado State line to this central point are not under irrigation, because the river runs through a cañon. From that down most of it is, if it is in the river bottom. The drying of the river below the center of the Territory is due not only to the taking of the water in Colorado but also to the taking of the water in New Mexico above on the stream. I have never been entirely to the headwaters of the Rio Grande. I understand that the forests on the Rio Grande and its tributaries in that State are to a great extent denuded. Now, whether the effect on the stream is produced by that fact or not, the flood waters seem to have ceased earlier than they did prior to that time. I mean to say

the high flow of water, where there was ample for all purposes, down to the point where the water began to fail for agricultural purposes as you got farther down the river. When I first came to the Territory there was ample water flowing in the Rio Grande clear to the southern boundary of the Territory, all along, as much as they needed at that time with the land appropriated.

4103 There is considerable more land under irrigation now along the stream than there was then, and it has increased as well from the center of the State north to the Colorado line as from the center of the State south, but not as great from the center south.

4104 Probably the first has fully doubled and the latter has increased not more than one-fourth or one-third. I should judge in the early times they used for irrigation about three-fourths of the water running in the streams. In some years they would take out nearly all of it and in the very early days at El Paso, which is only three miles below the New Mexico line, I have crossed the river there when it was absolutely dry. That was probably thirty years ago. For the first two years of my residence in New Mexico I lived in the southern part of the Territory. From tradition and historical works I have learned that irrigation was practiced along the Rio Grande when this Territory was a part of Spain as well as when it was a part of Mexico; and that is true of that part of the Rio Grande which now borders Mexico proper clear on down to fifteen or thirty miles below the New Mexico line. Back as far as thirty-five years ago I was down the river there. The lands at Juarez, Mexico, were reclaimed earlier than these up here.

4105 They were reclaimed earlier than these up here because El Paso was settled first and they had settlements there. So history tells us. These lands are still being irrigated. I know that I have been thirty or forty miles below El Paso on the Rio Grande and that irrigation extends that far, but how much farther I have no idea. I have been interested in large tracts of land along the Rio Grande in New Mexico—in one tract. On the headwaters of the Chama there has been a large amount of timber cut. I happen to own lands up there myself. Quite a large amount of timber has been cut there. The Chama is the largest tributary of the

4106 Rio Grande, as far as I know. I can't say that I have noticed any effect from the cutting of timber on the Chama except that the flood waters seemed to begin to dimish earlier in the year. The snow apparently melts off sooner. There are times of the year when there is a surplus of water in the Rio Grande through New Mexico, you might say from the middle of March up to the first or middle of June. I understand that there are opportunities for impounding waters in New Mexico—that there are a number of reservoir sites that have been set apart by the Government that are said to be good and that can impound those waters, and personally I should say that there are plenty of such sites. There is only one obstacle that I can see to prevent the saving of these floods or high

waters for the use of the people along the streams in New Mexico and that is the ordinary expense of impounding them.

4107 My observation is that nearly all of the water taken out of any streams has generally been used on the land and very little of it returned to the stream. Sometimes water is returned to the stream. I have seen that done. But the great mass of it is never returned. I have seen very little effect from the return seepage. Our climate is very dry and the soil is naturally dry when the spring time comes and it takes an immense amount of water to saturate the soil so that any water will seep back into the river; but I have never made any particular investigation of that subject. The interests of New Mexico are, directly and indirectly, almost entirely dependent upon agriculture and the outgrowth of irrigation

4108 in that regard, and the abrogation of the doctrine of irrigation would turn this country back to the desert or to a cattle or sheep ranch.

Recross examination on behalf of complainant.

By Mr. ASHBAUGH:

I never heard anyone seriously advocate the abrogation of the doctrine of the appropriation of water for irrigation in this Territory.

I attribute the main and the perpetual loss in the flow of the water of the Rio Grande through this Territory to the use of the water in the San Luis valley in Colorado.

The legislation on the subject of irrigation and water rights in the Territory of New Mexico reaches back to 1851 and 1852, but there was a system of laws that prevailed here under the Mexican government for two hundred years before that. At the time the legislature took hold of the matter under the territorial government there had been no legislation on the matter either by the terriorial government or by the United States. I think New Mexico was the first one that legislated on the subject, unless California might have gotten hold of it about the same time.

4110 R. E. TWITCHELL, Santa Fe, New Mexico.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I am an attorney at law and have lived in New Mexico since December, 1882. I have been district attorney, acting solicitor general, mayor of the city of Santa Fe and a member of a num-

4111 ber of boards and institutions in the Territory. I have been assistant solicitor of the Santa Fe road in New Mexico since January 1st, 1883. I am pretty well acquainted with the Territory. I have been connected with the Horticultural Society of New Mexico

ever since its inception. I was at one time a member of the board of regents of the agricultural college. The Territory of New Mexico is situated in what is known as the arid belt. In a very limited area in the high mountain regions of New Mexico there is sufficient rainfall to produce a crop.

The assessed valuation of this Territory is in the neighborhood of $40,000,000. I should say that practically all of the property
4112 that is assessed for taxes in New Mexico is dependent upon taking the waters of the streams and applying them to the lands for irrigation purposes, indirectly and directly.

I own a ranch and have been engaged in irrigation to some extent. I have been one of those statesmen and farmers. I have a fruit ranch in Santa Fe county, eighteen miles from the Santa Fe railroad, on the Santa Cruz, a tributary of the Rio Grande.
4113 If the plans of the Government under the reclamation service were carried out and the water flowing in our catchment areas were properly preserved I should say the irrigated area of New Mexico could be increased from three-quarters of a million to a million acres. An irrigated acre of land in one valley is worth more than an irrigated acre in another valley. You cannot fix an average value for all. An irrigated acre of land in the Pecos valley is worth more than in the Rio Grande valley. $50 an acre is a very low estimate on an average of what an irrigated acre of land
4114 is worth. Forty acres of irrigated land will support a family.

The future of the Territory depends upon the continuous application of the waters of the streams to the arid lands. The property which has been created by irrigation could not have been so created and could not exist if the doctrine of riparian rights prevailed in this Territory. Should that doctrine prevail the effect would be that New Mexico would be what it was before there ever was an irrigating ditch taken out and it would become purely
4115 a pastoral country. Crops could not be raised. The doctrine of priority of rights to the waters of the streams have always obtained in New Mexico prior to the adoption of any law upon the subject. The doctrine of riparian rights never did prevail here. Should the doctrine of riparian rights prevail in New Mexico the reclamation act of June 17, 1902, would have no force or effect
4116 whatever here. It would not do us any good.

I know something of the flow of the Rio Grande river ever since 1884. It has very radically decreased since 1884 in the lower Rio Grande; and in the upper Rio Grande above the mouth of the Chama—this is only my judgment, based upon observation and statements made to me by engineers representing the Government—the flow of the river above the mouth of the Rio Chama and the Rio Embudo has not increased to any large extent. The mouth of the Chama river is five miles north of the town of Espanola, and the latter place is about twenty miles across the country from Santa Fe, or twenty-five miles by rail. The flow of the Rio Grande has decreased at other locations. South of the Albuquerque, for instance.

I attribute that decrease to the deforesting of the mountain
4117 areas in New Mexico and the rapid melting of the snows. If you would take all of the water out of the Rio Grande above the State line it does not require any person to say that it would absolutely destroy all of the irrigated areas ordinarily irrigated out of the Rio Grande in New Mexico until you get as far south as the Rio Chama. The Rio Grande is fed by a number of tributaries flowing into it south of the Colorado line. The Rio Chama at times is a river equal in volume to the Rio Grande; and
4118 south of that there are eight or nine streams which feed the Rio Grande and the water from which streams is used for irrigating the lower valley. There is very little irrigated area from the waters of the Rio Grande north of the mouth of the Rio Chama, and the State of Colorado has taken very little of the waters of that stream. Two or three branches of that stream head in the State of Colorado or very close to the Colorado line.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4119 Since the building of the Denver & Rio Grande railroad and the building of the Atchison, Topeka & Santa Fe railroad in New Mexico the increase in irrigated area in the water shed of the Rio Grande in Colorado has amounted to about 180,000 acres. The increase in area in New Mexico in the water shed of the Rio Grande does not exceed three thousand acres, and by the Government reports of the amount of water flowing through the cañon at Embudo I cannot say that there has been any very marked decrease in the flow of the Rio Grande at that point. If all of the water that is used for the irrigation of the increased area in Colorado were allowed to flow or had been allowed to flow through the Rio Grande it would naturally have increased the value of that river. The taking of the water for irrigation purposes through the whole territory has served to decrease the irrigated area in the lower
4120 valley, and the normal flow of the Rio Grande. It has had the effect of rendering barren lands that have been at other times irrigated in the lower valleys. The flow of the river through the south half of the Territory has been diminished very much. I attribute the decrease in the flow of the river throughout the season of the year when waters are necessarily used for the irrigation of lands to the deforestration of the lands in Arriba county, in the high mountains in which the Chama rises, in the forest reserves, and the rapid melting of the snows in the spring which would have ordinarily remained as late as in July and August. I think the average amount of snow fall in the last ten years, beginning with 1890 and ending with 1900, has been less than in any cor-
4121 responding period prior to 1890. During the present year we have had more snow fall than for ten years. According to my recollection, I think from about 1890 to 1893 we had a big

snow in one of those years. There was a very heavy drouth
4122 about 1893.

I never heard anyone advocate the idea of having the doctrine of riparian rights prevail in New Mexico.

Cross-examination on behalf of defendants.

By Mr. DAWSON:

I have seen ancient deeds transferring property holdings into the Rio Grande valley which were—one was dated in 1712. That was a deed that was delivered to me when I bought a piece of land in the Rio Grande valley, and by that deed was transferred a right to the Ascequia Madre on the Santa Cruz. The Santa Cruz is
4123 a tributary of the Rio Grande, its mouth being opposite the town of Espanola in Santa Fe county; and in another deed, through the courtesy of General Blanco and a gentleman whose name is Goyot, a representative of the Mexican government, I saw a deed in which the Ascequia Madre at what is now the city of Juarez in the Republic of Mexico was mentioned, and that instrument was 238 years old. There are remains of ditches in San Juan county, on the Rio de Las Animas and on the Chama which are prehistoric. At the town called Aztec in San Juan county, on the right bank of the Animas river, the existence of an irrigating ditch running from a point opposite the present ruins of a pueblo which was mentioned by Juan de Onate is plainly apparent as far north as what was the Ute reservation, and that was in ruins when he made his
4124 trip through this country in the 17th century; and in the pueblo of Cochiti there are innumerable ancient ditches taken out of the Rio Grande that have been destroyed by floods and new ones constructed; but the oldest one is the Cochiti, and it has been abandoned for over two hundred years.

These things I have knowledge of through an inclination which I have always had to investigate along archæological and ethnological lines.

The part of New Mexico which could raise crops without irrigation is very limited; and when I refer to crops without irrigation I refer to the crops designated by the Mexicans as *temporal*. It is a crop raised entirely by rainfall. In areas above an elevation of 7500 feet small grains and potatoes can be raised without irrigation, but the area is very limited and would not support any considerable population.

The tax valuation of the property of New Mexico is about
4125 twenty per cent. of the real valuation, and the taxable valuation of the Territory is about one hundred millions, and this is dependent upon agriculture by irrigation, excepting the railroad property, and of course the latter is dependent to a great extent upon the former.

I have fished up at Wagon Wheel gap on the headwaters of the Rio Grande. I know that the Denver & Rio Grande Railroad Com-

pany has been very diligent for the last two years cutting timber on the headwaters of the Rio Grande and its tributaries and I think the cutting of the timber and the denuding of the forest areas has very little to do with the fall of the snow but has everything to do with what we call the run-off or fly-off. You take and cut off
4126 all the trees or a large portion of the trees in the mountain ranges where the snow is exposed to the sun and the atmosphere and there is a very pronounced evaporation. I have seen in the higher ranges snow absolutely disappear without any run-off.

My understanding is from Mr. Arthur P. Davis, one of the Government engineers, that from investigations and measurements kept by the Government in the cañon about Embudo, the
4127 water of the Rio Grande has not materially decreased there in that cañon. My experience in regard to the denuding of the timber is confined to what is known as the Tierra Amarilla grant and the mountain areas of southern Colorado adjacent to that property, through which portion of the country the Rio Chama has its source, and that is the largest tributary of the Rio Grande. There is some irrigation between the Colorado line and Embudo. There is some at Rinconada and other places up there, but
4128 not enough to make any perceptible effect on the river. There has been a perceptible decrease in the flow of the Chama river in the last ten years, but there is but a small part of its drainage area in Colorado, and that part which does lie in Colorado has been practically denuded so far as forests are concerned. Part of its drainage area here in New Mexico has been stripped of its timber. All of that lying along the Rio Brazos and the Rio Chama proper and the Little Chama upon the land grant known as the Tierra Amarilla, with the exception of the spruce growing upon the precipitous portions of that grant, has been cut off. The Tierra Amarilla grant has an area in New Mexico, I should say, of approximately 600,000 acres. The first time I ever saw that grant was in the fall of 1885, and from the town of Chama on the Denver & Rio Grande railroad down to the town of Tierra Amarilla and Parkview it was a continuous body of very heavy pine timber, and that has all been cut off. That distance is about seven-
4129 teen or eighteen miles between those points. I should say the decreased flow of the Chama in the last fifteen years has been fifty per cent. That is, at times when the water is
4130 needed. I don't think the return or seepage water makes any perceptible show in the river. It may get back. I don't know whether it does or not. On the Rio Grande it might come out clear down to Albuquerque.

The first year in which I saw the Rio Grande entirely dry at any point I don't remember exactly, but it has been since 1890. There has not been a very considerable amount of irrigation between the mouth of the Chama and Embudo. The valley at the mouth of the Chama is about a mile wide and it narrows up to the cañon about

four or five miles from Embudo at a place called La Joya. I think the distance between those two points is about ten miles. From the point where the Rio Grande crosses the Colorado-New Mexico line there is more or less irrigation all the way from a point about five or six miles below to the Rio Grande railroad bridge below,
4131 a distance of about thirty miles. It is true that during certain portions of the year there is more water flowing in the Rio Grande through New Mexico than is used by irrigators in the Territory along that stream. And that is true practically every year. There is always water passing through Las Cruces, but only for a very small period, and that is owing to very heavy rainfalls and flood waters.

There are places along the Rio Grande in New Mexico where water could be stored. The Government has in contemplation now the construction of a dam at a place near Engel which involves the construction of a dam which will make a reservoir forty-six miles in length, storing water which will serve to irrigate, not only one year but a subsequent year in the event of the failure of
4132 water, about 180,000 acres of land. The construction of this reservoir with the flow of the stream as it has been of late years would furnish water for the irrigation of lands now under cultivation as well as additional lands, and I believe the construction of this reservoir will serve to add to the irrigated area many miles north of the reservoir. Of course that is hypothetical.

I have been acquainted with the Arkansas river in Kansas and Colorado since 1873 at Dodge City and near Nickerson and all along the river from about old Fort Lyon to Pueblo. I have seen the Arkansas river dry near Nickerson; that is, no flowing stream; that was either in the spring of 1877 or the spring of 1878. I have seen it dry a great many times along about Granada and about
4133 Coolidge and through there. I saw the river at Dodge City in 1873 and there was water flowing in it then. We went down to Camp Supply and forded the river, but there was very little water in the river then. Something like knee-deep to the horses. It was probably forty or fifty feet wide. I have seen the Arkansas river in the last four or five years a raging torrent and at other times I have seen it when there was no water flowing in it at all; and that is true not only in Colorado but away down in Kansas.
4134 I think the character of the Arkansas river is that sometimes there is a little water and sometimes no water.

Cross-examination on behalf of defendants continued.

By Mr. HAYT:

The most ancient settlement along the Rio Grande in New Mexico mentioned by the Spanish explorers is the pueblo of San Juan de Los Caballeros, and that is about eight miles north of the town of Espanola. The place called Abiquiu was an ancient pueblo, and the San Juan de Los Caballeros was also an ancient pueblo.

According to reports made by the historians of the parties and according to statements made to me by Professor Bandelier, the Spaniards in their first march up the Rio Grande were at Abiquiu. The town of San Juan de Los Caballeros is immediately across the Rio Grande from the mouth of the Chama. The Spaniards mis-
4135 took the Rio Chama for the main river and went to the town of Abiquiu. They remained at the town of Abiquiu for a few years and heard of the town of Santa Fe, which was known as the pueblo of Analco and was a big pueblo village. They came over here and changed their headquarters to Santa Fe. The first settlement was at Abiquiu. The irrigating ditches were constructed before that time. The Indians occupied that country long before the Spaniards came here. These were the first Spanish settlements in the Territory of New Mexico. There is a census taken by the Spaniards and a copy of that census is in the archives over here in the surveyor general's office, which shows the pueblos of San Ildefonso, Santa Clara, and others, including a number of pueblos that I cannot recall the names of just now. That census was taken
4136 about 1798 by the Spanish government. It shows the number of people living in that valley at that time, and that is about twice the number that is living there to-day.

Some of those ditches that were in use then are in use to-day along the Rio Chama. The first railroad was built from Alamosa, Colorado, to Espanola, New Mexico, in either 1879, 1880 or 1881.

I visited the San Luis valley in Colorado first about 1885 or 1886. That valley is about a hundred miles in length and sixty
4137 miles in width and is very level. According to geologists it was a lake at one time. I think that lake was transformed into its present condition there by some great seismic disturbance by which the waters were discharged through that cañon—the cañon that the Rio Grande flows through now. The water in the San Luis valley is very near the surface. They have artesian water there nearly all over the valley, and the water level of the country
4138 generally is only four or five feet below the surface of the soil. I know there are a great many artesian wells constantly flowing water in the San Luis valley. I visited the large artesian well which lies above the town of Alamosa, up the Denver & Rio Grande tracks, and I have also been at the other one. It has been running for many years. The last time I saw it it was a large flowing well. It must have flowed a thousand gallons a minute.
4139 It must have been six or eight inches in diameter, and the discharge flows into the Rio Grande; but the last time I saw it it discharged out on the ground adjacent to the well and found lodgment in the river. I know there are a great many artesian wells there, but I don't know that there are a great many like that. There are a great many in the town of Alamosa, and they all drain into the Rio Grande, as I understand. The whole drainage of the valley is into that river. Those ditches up there were constructed the first time I went up there; that was about 1885; and whatever

seepage or drainage there may be from the lands irrigated by
4140 these ditches in that valley goes to the Rio Grande. You take water out of a ditch and spread it over the land and there is a certain percentage of it evaporates. That which goes into the ground—now, I am confining this statement to the San Luis valley on account of the peculiar formation of the surface there. There is only one way for it to get out and that is through the Rio Grande. I would not say that exists in other localities. The geological formation is such up there that it could not get out in any other way. Some of that water might eventually get out as far east as the Spring river near Roswell. This San Luis valley is a vast area of country that is nearly level, with the water level of the valley close to the surface of the ground, and the drainage of which is through the Rio Grande near the State line between the Territory of New Mexico and the State of Colorado.

4141 I know there was more snow fall during the '80's than during the '90's. And I remember reading in the newspapers in about 1884, 1885 and 1886 that the snow fall on the mountain ranges between Antonito and Chama was very large, and about the trains being stalled up there. But I didn't see it myself. I know that during some of those winters the Rio Grande railroad was put to great expense on account of the excessive snow fall. The construction of all those snow sheds between a point about twelve miles from Antonito and Cumberos shows the snow fall up in that country. There are a great many snow sheds over there.

4142 Forty acres of irrigated land will support a family with results equal to 160 acres in the Mississippi valley. Ten acres of land intensively cultivated will support an ordinary family and make money, and the larger the family the better, if conditions are such as you have them in some portions of Colorado where you raise sugar beets.

The first time I saw that artesian well in the San Luis valley there was very little water flowing in the Rio Grande above the well, and when we came back to New Mexico I noticed that the flow at Embudo was about the same as it ordinarily was, and the fact struck me as being very peculiar.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4143 There was very little water flowing in the Rio Grande at Alamosa above the well, not nearly so much as was flowing at Embudo. The river was practically dry. The lower end of the San Luis valley is at or near the town of Antonito, and I should say the Colorado-New Mexico line is near a place on the Denver & Rio Grande railroad called No Agua. Below the artesian well I spoke of and flowing into the Rio Grande there are two very good streams. On the left bank of the Rio Grande and coming from the main range of mountains, running down as far as Taos, there are some

small streams. These tributaries perhaps would be sufficient to account for the flow of water through the cañon even though it was practically all taken out above those tributaries. This was a remarkable thing to me. I do not think there was enough water flowing in the Conejos and in the San Antonito to account for
4144 all the water at Embudo. I made some inquiries and the theory was advanced for the presence of the water at Embudo that there was a very small irrigated area between Colorado and Embudo, and the theory was that at Embudo the water flowed through a subterranean passage into the Rio Grande through the big cañon.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

4145 I think the cutting of the timber along the main range from Santa Fe, taking this range of mountains here, clear up to the Colorado line and into Colorado, has served to run the snow off earlier in the spring and reduce the flow of water in the Rio Grande at times when it is ordinarily needed for irrigation. I think the cutting off of the timber is the prime cause which has increased or intensified the evaporation. I think it has been the prime
4146 cause of the disastrous floods we have had. The denuding of the forests I have spoken of continues to the present time.
4147 This cutting of the timber extends to the Government lands.

4148 PEDRO PEREA, Santa Fe, New Mexico.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I live at Bernalillo, seventeen miles north of Albuquerque, and have lived there all my life. My father was born there before me. Bernalillo is on the Rio Grande. I have been a member of the territorial council several times, and was a delegate to the 56th Congress.

Yes, there is land irrigated from the waters of the Rio
4149 Grande in and around Bernalillo. That is the only way we cultivate lands there—by irrigation. I could not tell exactly how long irrigation has been practiced there from the waters of the Rio Grande. Two or three hundred years I suppose. I don't think there has been any decrease in the area of irrigated land in the vicinity of Bernalillo within late years. Yes, there has been a very material decrease in the water for the last twenty or twenty-five years—twenty years anyway. (Objection by defendants.) As to the percentage, well, the decrease has become in the summer
4150 time, in the latter part of June and July, sometimes almost to nothing. (Objection by defendants.) I have never been up

in Colorado. Of course I have heard and read about these waters that have been appropriated by canals for irrigation purposes there. (Objection by defendants.) These appropriations were made something like twenty or twenty-five years ago. I can't tell for certain. In my judgment the water of the Rio Grande has diminished in flow since the appropriations in Colorado commenced. (Objection by defendants.)

4151 I think the appropriations of the waters in Colorado is the reason why the water has decreased here in New Mexico in the Rio Grande. (Objection by defendants.) I am somewhat acquainted with the lands irrigated from the waters of the Rio Grande below Bernalillo. Between Bernalillo and Albuquerque I do not think the irrigated area has decreased. I am pretty well acquainted with the valley of the Rio Grande to the Texas line. The lands which produced crops along the valley of the Rio Grande between Bernalillo and the Mexico line entirely depend upon the

4152 waters from the Rio Grande in order to produce crops. If the people along the Rio Grande were not permitted to take the water from it for irrigation purposes their lands would be entirely worthless, as they are to-day in the valleys above the Asequias and the population would have to emmigrate.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

I have never heard anyone in the Territory here advocate the doctrine that we should not take the waters out of the rivers for the purposes of irrigation. I heard that for the first time in connection with the so-called Stevens bill in Congress. That would prevent them from taking the waters. I think the taking of the waters in the State of Colorado and appropriating them, as I understand it has been done in the San Luis valley, has affected irrigated farms, in the Territory that were in existence prior to the taking of

4153 the water in Colorado. (Objection by defendants.) The taking of that water has arrested the further development of irrigation along the Rio Grande in the Territory of New Mexico. (Objection by defendants.) The effect, then, of taking the water in Colorado and appropriating it for irrigation has interfered with and injured and set back the irrigation that was in existence and has had the effect to retard the further development of it after that. (Objection by defendants.) If the Colorado claim should pre-

4154 vail, that she has a constitutional right by reason of her sovereignty to take all of the waters that rise within her territory and flow subsequently into other Territories and other States and to apply all of them within her own territory for irrigation, the effect would be that it would render our lands and our property here entirely worthless.

Cross-examination on behalf of defendants.

By Mr. HAYT:

I have heard and read something about the doctrine of riparian rights, very likely, for many years. It is no new matter to me. But I never had any opportunity to talk with the people in the vicinity of Wichita, Kansas, in reference to that matter, and I don't know anything about the claims of Kansas or this Colorado-Kansas controversy except what little I have seen in the newspapers. I know that such a claim has been made from what I see in the newspapers, and of course I hear they are taking testimony, and of course I know that is a fact.

4155 I will be fifty-three years old next April, and I suppose my earliest recollection of the Rio Grande river will extend pretty nearly to that time. I never heard of the river being dry when I was a child, and I was familiar with the river at that

4156 time.

I understand your question, that if the testimony should show that there has been no diminishing of the waters at Embudo—whether in that case I would change my opinion about the taking of the waters in Colorado as affecting the increase or decrease in the Rio Grande, and I say I could not find anything to change my opinion from what I have seen myself, in my own actual experience here at home and below. In other words, I would rather take my own word than anybody else's, and my actual experience has been with reference to the river in the vicinity of Albuquerque and from there north and south for a distance, and I am not speaking of the river in the vicinity of Espanola and north from Espanola

4157 from actual experience.

Q. Then if it be a fact that the flow of water in the river has not diminished in volume at Embudo, New Mexico, near the mouth of the cañon, you would still be of the opinion that the diminution in the flow of the river in the vicinity of Albuquerque was caused by irrigation in the State of Colorado?

A. Well, I would still be of the opinion that the experts or whoever testified there may have made a mistake. I couldn't change that at all.

4158 I don't think they ever had any Government measurements at Embudo before they appropriated the river in Colorado. Now, if they did have such measurements it would not change my opinion, I do not pretend to be an expert in these matters; I just testify to what I know of my own knowledge. I do not believe that anything would change my opinion from what I know myself, and I am testifying from my own knowledge as to the flow of the river at Albuquerque and in that vicinity. Before we ever heard or thought of such a thing as a diminution of the waters in the Rio Grande I first began to hear about taking the water away for irrigation purposes in Colorado. It was a few years after that when I first heard about the river getting dry in Valencia county

So that is the reason why I always connect it with the application of the waters in Colorado. I have no personal knowledge of
4159 irrigation in Colorado. I have never seen it; but I do not take everything I see in the newspapers for Bible truth until I have seen it and heard and read of it so often that I think it is a fact that they have appropriated waters up in Colorado. I think this diminution in the flow of the river through Valencia county must have been something like twenty or twenty-five years
4160 ago. It was an unheard of thing at that time, at least I had never heard of it. My impression is that it was at or about the time the railroad came in, after very likely, or a short time before. The railroad was built here in about 1881. It may have been two or three years after that, or a very short time before. That is my impression now. I refer to the Atchison, Topeka & Santa Fe railroad that was built through to Bernalillo. My impression of the Chama river is that once when I saw it it was dry and the other time when I saw it it had some water in it. The ditches in
4161 my vicinity are cleaned out every season, but they are not enlarged. They are just the same size. None of them has been enlarged that I know of.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

I know from my own experience that they tried to build what they called a low line canal above Albuquerque a few years ago, and of course I thought they would take all our water. I
4162 was the mover in going to the Supreme Court of the United States to prevent them from building it. I did not prevent them in law, but I prevented them because they got "broke" before I did. They didn't get through with the canals.

I was born on the banks of the Rio Grande and have lived there ever since, and my opinion and judgment are based upon my actual daily observations in this valley during all these years since I was a child. I fix the beginning of the perceptible diminution of the river after those ditches were taken out in Colorado (objection by defendants) and within a very few years after.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

4163 In my opinion the future development of this Territory largely depends on irrigation or the application of the waters of the streams to the arid lands. If we can't find any more lands to irrigate I think we are estopped from any more developments. I am engaged in farming and stock raising. That has been my business all my life.

4164 SOLOMON LUNA, Santa Fe, New Mexico.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I live in Los Lunas, Valencia county, New Mexico. I was born there and have lived there all my life. My father was born there before me, on the same place. The lands that are cultivated in Valencia county are so cultivated by reason of applying the waters of the Rio Grande to them. Entirely so. I should judge there are about 20,000 acres of irrigated land in Valencia county.
4165 The irrigated lands in that county have decreased within recent years about one-third. That is, there is one-third less land cultivated now than there was then. The decrease began about 1882. There is not as much water in the Rio Grande as it passes through Valencia county as there was in former years. (Objection by defendants.) This decrease in the flow of the water began along about 1880. I think in 1879 or 1880 was the first time the river went dry to my knowledge. At the present time during the summer months the flow of water in the stream is a great deal less than it was in 1880. (Objection by defendants.) The river was
4166 never known to go dry before 1880, and since 1880 it has gone dry every summer at some time during summer. I know that they irrigate lands from the Rio Grande in Colorado on an extensive scale. I don't know the exact time when it began to do this, but it was before 1880. (Objection by defendants.) I am interested in irrigated lands in Valencia county. The only reason I can give for the decrease of the water in the Rio Grande in Valencia county is that the water has been taken by those canals in Colorado.
4167 (Objection by defendants.) The stream began to diminish when they began to take water out up in Colorado. (Objection by defendants.) And it has continued to decrease ever since. (Objection by defendants.) We have lost every year. The irrigated area has decreased in Socorro county, which adjoins Valencia county on the south, and also Donna Ana county, the county adjoining Socorro on the south. I should judge the percentage of decrease in those two counties has been about forty per cent. (Objection by defendants.) The
4168 reason for this is on account of the lack of water. A good many people own lands down there now that they do not plant because of the uncertainty of the water, and they cannot raise anything on those lands without irrigation. There is not sufficient rainfall to raise a crop. I think the conditions with respect to the rainfall in the Rio Grande are about the same as prevail throughout the entire area of New Mexico. The future development of the resources of New Mexico entirely depends on applying the waters of the streams and flood waters to what is known as arid land.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4169 I am forty-six years old, and have lived all my life on the banks of the Rio Grande, and my father lived in the same town. I can't give the exact year when the decrease in the flow of the river became apparent, except that when it went dry my father was alive, and I think he died in 1880 or 1881. That was the first time I ever saw the river dry at Los Lunas. My father was seventy-two years old when he died.

If the large ditches in Colorado were practically begun and finished along about 1880 and 1885, this decrease I speak of might
4170 have been right after that. Of course I don't know.

If the Colorado claim should prevail, that they have a right to take all of the water in the streams that rise in Colorado and flow into New Mexico, it would ruin the lands, of course, and depopulate those towns that depend entirely upon their farmers. Most of these towns in the valley from Bernalillo south depend on the water, and if they cannot get the water of course the people will have to leave and go elsewhere to make a living. This taking out of the water above us has not only injured prior irrigation and prior rights of appropriation, but has arrested the further development of our valley. Yes, it has done both of those things. To the best of my knowledge, the appropriations of water through Valencia county were made 200 years ago. The irrigation dates back of that,
4171 even, and has been continued down to the present time. Up to about thirty years ago they were getting more land under cultivation right along. Every year they got more land under cultivation until the river commenced to go dry, and then they commenced to abandon it, and some of the ditches they have abandoned entirely in my county of account of the loss of water. And this extends through two other counties lying south of Valencia. This material diminution in the flow of the river is most noticeable in the summer months when the water is most needed.

Cross-examination on behalf of defendants.

By Mr. HAYT:

I have heard my father mention that when the river went dry in 1879, I think it was, that that was the first time he ever saw
4172 it dry at Los Lunas, and I know of my own knowledge that it did go dry then. I am not sure whether it went dry in 1880 or not. If it did it only was for a short time. In 1881 I don't think it went dry, and I don't remember whether it went dry in 1882 or 1883. It has been dry or very low ever since 1879. It has been dry below Los Lunas in all those years since 1879. I have never been on the headwaters of the Rio Grande in Colorado. The tributaries of the Rio Grande in New Mexico above Albuquerque are the La Plat-e, the Las Animas and the Chama.

I know that within the last two or three years the snow fall has been very much less upon the drainage area at the headwaters of these stream than during former times. I don't know whether it has been as far back as ten or fifteen years. I think three
4173 years ago we had plenty of snow in the mountains. The area at the headwaters of those streams was heavily timbered during the earlier years. There has been some timber cut off. I don't know how much. Yes, there has been a vast amount of timber cut off and the lumber shipped out of the country, and that has been going on, I suppose, ever since the railroads were built. The timber of course retains the moisture and the snow lies on the ground a good deal longer.

I don't know anything about the flow of the river in the vicinity of Embudo.

The appropriations in and about Los Lunas date back two or three hundred years, but I don't know to what date they relate back in old Mexico, but I don't think the use of water for irrigation purposes in the Republic of Mexico antedated the taking of water
4174 to any considerable extent in New Mexico. I can't say that I have ever made any investigation on that point. I think that in some of those towns from Bernalillo south the cultivation was begun as early as 1640. I don't know whether that antedated the cultivation by irrigation in New Mexico or not. I know of this grant that was made to my great-grandfather in 1736 at Los Lunas. That was made to two brothers and they were farmers. They were farming some of the land then. It was granted by the Spanish government.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

4175 That grant did not say that it carried an appropriation of water from the river. That was the purpose, I suppose, they were getting it for—for cultivation.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

The first year I noticed any diminution in the snow fall was about the year 1901. There might be some years, of course, that we had more snow than others. I don't think there was any material difference in the snow fall back of there except in the last two or three years it has been less. I think it is a matter of common notoriety and a fact generally known that the snow fall during the winters of 1901–2, 1902–3 and 1903–4 was less than it had been during the prior years.

There are some grants in my county known as the pueblo
4176 grants which were given to the Indians. The Isletas have a grant there adjoining us on the north. It was an Indian

grant made by the Spanish government and it must have been prior to our grant, because our grant was bounded on the north by the southern boundary of the Isleta Indian grant. It is my opinion and my belief that the lands in these Indian grants were irrigated for a great many years prior to the grant made to my great-grandfather. (Objection by defendants.)

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

4177 Speaking about this Indian reservation, I think there has been a decrease in the area of the irrigated lands there within recent years. I should say to the extent of about ten per cent.

I am treasurer and collector of the county of Valencia, and a member of the Republican national committee from New Mexico and this has been my third term in that position. I testified that I was a farmer and stock raiser.

Recross-examination on behalf of defendants.

By Mr. DAWSON:

4178 The farther south you go on the Rio Grande in New Mexico the greater the percentage of the land which is short of water for irrigation, and in this Indian grant I spoke of there has been about ten per cent. gone out of irrigation that was formerly irrigated. The next below that is in Valencia county, and there is about 33⅓ per cent. less irrigated than formerly. In Socorro county and Dona Ana county there is about forty per cent. less. I don't know that this proportion increases south of Dona Ana county. Of course that is the last county south.

Los Lunas is twenty miles south of Albuquerque and Bernalillo is eighteen miles north of Albuquerque, both in the Rio Grande valley.

Recross-examination on behalf of defendants continued.

By Mr. HAYT:

4179 Albuquerque has about 10,000 inhabitants. They do considerable irrigating there on both sides of the river, but more so on the west side. The town is on the east side. Albuquerque obtains its water supply for domestic and other purposes by a pumping plant. The pumping plant is north of the town, at the foot-hills, about three miles from the river. What is now the town of Albuquerque used to be farmed before the town was built—before the railroad came in. The old town is about a mile away from there, toward the river, west of the new town. It is true as shown by tra-

dition and the earliest information that can be gathered that the lands along the Rio Grande were irrigated by the Indians prior to the coming of the Spaniards to this Territory.

ROSWELL, NEW MEXICO, February 4–6, 1905.

4181 WENDELL M. REID, Roswell, New Mexico.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside at Roswell, New Mexico, and am civil engineer and district engineer in the United States Geological Survey, in the reclamation service. I came to Roswell from Colorado in 1889.

4182 I took my engineer's degree at the University of Vermont, and have been following my profession as civil engineer since I was graduated in the class of 1886. My first connection or association with any irrigation enterprise was in the spring of 1889 when I came to the Pecos valley, first to Carlsbad and then to Roswell. Carlsbad was then known as Eddy. It is about seventy-five

4183 miles below Roswell. I become connected with the Pecos Irrigation & Improvement Company. The purpose of that company at that time was to develop an irrigation plant at Eddy, now Carlsbad, and also one near Roswell. I was assistant engineer at that time. Nothing had been done by the Pecos Irrigation & Improvement Company when I became connected with it. It was just in its infancy. Subsequently within the limits of Eddy county it constructed what is known as the Lake McMillan dam for the purpose of impounding the waters of the Pecos and storing them; also Lake Avalon, which is used both as a storage and distributing reservoir. Lake Avalon is six miles up stream from Carlsbad and Lake McMillan is seventeen miles. Lake Avalon was finished in the winter of 1889–1890. Lake McMillan

4184 was finished in the winter of 1903–4. Lake Avalon subsequently went out and was rebuilt before Lake McMillan was finished for the first time. Lake McMillan was designed to submerge eight thousand acres. Lake Avalon dam is about thirteen hundred feet long. Lake McMillan dam is sixteen hundred and some feet long across the river. I mean the length of the crest. Lake McMillan was designed to submerge eight thousand

4185 acres; Lake Avalon about three thousand. Other improvements were constructed in connection with these dams, such as a system of canals and headgates, laterals, main and sub, quite an extensive flume or aqueduct across the Pecos river, and the necessary small headgates, diversion gates, etc. The McMillan dam was designed to hold one hundred thousand acre-feet. I don't know how much the Avalon dam was designed to hold. Roughly estimated, I should think that in actual construction these improvements I have spoken of probably cost a million dollars. When I came to New Mexico there was no land irrigated directly from the waters of

the Pecos river. There was a little cultivation on what is known as Black river, a small stream, and around Seven Rivers, from some springs, but very slight.

In 1898 I became chief engineer of the Pecos Valley
4186 Irrigation Company. At that time there were about 13,000 acres of land irrigated in Eddy county. They were in a high state of cultivation and were cultivated from the waters of the reservoirs I have described. That is the only means they had. There is now between 14,000 and 15,000 *thousand* acres of land cultivated by irrigation from these reservoirs. Before these lands were irrigated they were simply range land and had no value to speak of at that time. They are now selling
4187 at from $30 to $75 or $80, and sometimes as high as $100 an acre. I was engineer and superintendent of the Roswell Land & Water Company from 1894 to 1898. The irrigated area in Chaves county has increased very materially since I came here—nearly fourfold. There are now about 15,000 acres irrigated in Chaves county from the South Spring, the North Spring, the Berrendos and the Hondo. These rivers are tributaries of the Pecos. The Pecos river rises in the mountains to the east and north of Santa Fe. It empties into the Rio Grande on the border of Mexico and the State of Texas almost directly south of this
4188 point. There is about three hundred miles of this river, I should judge, in Texas. The lands in Chaves county before they were reclaimed had no value except as grazing land, which at that time had hardly any monetary value, not above the Government price of $1.25 per acre. Some of these lands I have since sold for $400 an acre. On a general average I would say they would run from one to two hundred dollars an acre. These lands
4189 are of this value because they have the water supply. The soil and climate are admirably adapted to crops that produce great value, but without the water there would be no value.

The positions I have occupied during the last few years have caused me to study more or less the irrigation problem and the amount of land which can be reclaimed by the waters of the streams at our disposal here. Even with the methods now in use here the acreage can probably be increased seventy-five thousand; but by improved methods such as are used in many districts where water is very scarce possibly that amount could again be doubled. Some of the land I have in mind that could be irrigated is not worth filing on to-day under any of the Government laws. If it could be reclaimed by the application of the waters of these streams
4190 here, and whenever it is in a good state of cultivation, though perhaps not a perfect state, it is worth from $50 to $75, and as cities and better methods of transportation come it will increase above that. I believe that every forty acres in the Pecos valley will support an ordinary family of five. Of course what they will support in the towns adjacent to it is in addition to that. There is not sufficient rainfall in this locality to produce crops—not a paying crop.

Some years of course are more prolific than others in rainfall. It surely is necessary in order to develop this country to use the waters of the streams for irrigation purposes. The country would simply return to the condition it was in before irrigation was undertaken if we were obliged to let the waters flow in these streams as they had always flowed before they began to take them out. In that
4191 case the present population would either have to move or die.

Well, if we were not permitted to take the water beyond the second 40 back from the river, of course you would catch more in the second 40 than in the first, but it would still reduce the irrigated area to a very small percentage of what it is now, and in addition to that I might say that the lands adjacent to the stream are frequently not good lands. It is inferior to that which is back of it. That is caused by the fact that most of our waters in the arid country, and especially through the south, are carrying a
4192 certain amount of detrimental salts or solutions adjacent to the streams. By overflows these salts have been deposited and have not leached out, and the land is not as productive as the land back that has not been subjected to these salts. I think about one per cent. of the land which is under irrigation in the Pecos valley in Eddy county immediately adjoins the stream, in the first or second 40 back therefrom.

I am somewhat familiar with the national reclamation act of June 17, 1902. If the doctrine of riparian rights, which is that the waters of a stream should be allowed to run unobstructed and unaffected, should prevail in my district, I do not know of a project or place even thought of that could in any way be benefitted by the reclamation act. If we were permitted only to apply the waters to the first and second 40 acre tracts away from the stream the effect would be to completely ruin most of the projects. It is pos-
4193 sible that some very small ones might be constructed within the limits of economy, but none that I have under consideration now could even be operated under that.

Cross-examination on behalf of complainant.

By Mr. Ashbaugh:

The Pecos river through Eddy and Chaves counties had a flow in 1894 of something like 450,000 acre-feet. It varies in size from a discharge as low as sixty to seventy cubic feet per second of time up to 83,000 cubic feet per second of time, as it occurred during October, 1904. The minimum flow usually comes in the latter part of May to the first part of June, and is then from sixty to seventy second-feet. The maximum flow as a rule occurs in the month of July or August when it gets up to any height. The rains are in the mountains and the river then often reaches 10,000 second-
4194 feet. Perhaps it would average through the month of July quite often up to three or four thousand. In the winter at the present time, without any floods, the flow is probably three hun-

dred second-feet. The river rises in the mountains northeast of Santa Fe and frequently goes dry in the summer above the crossing of the Rio Grande railroad at Santa Rosa, but at Santa Rosa it is fed by ever-living springs, which, however, sink at a point about fifty miles north of Roswell, and the river is often dry then from that point to a point about fifteen miles north af Roswell, where it is again fed by what is known as Salt creek, another series of springs, Bitter creek adjacent to it, and from there on it is an ever-living stream. As to the bed of the stream, from Cedar cañon it flows through a sandstone formation on the surface, with indications of limestone beneath. After passing Cedar cañon or a point about sixty miles above here it enters and remains in a limestone formation all
4195 the way in New Mexico. All the water in the river which always flows for about fifteen miles above Roswell, may possibly not come from those springs. There may be a possible flow through the sands in the bottom of the river. These waters may come from rains and snows, and are then collected. The Pecos and its tributaries are supplied, primarily, from the rains and snows. The river rises up in the mountains where there is considerable snow fall, and that snow begins melting early in the spring, about the latter part of March and through April and into May. I have known seasons in which we could attribute none of the water of the Pecos
4196 to snow fall. Sometimes possibly it does; but in the management of the water in the Carlsbad district I learned not to depend a great deal upon the snow fall. I depended almost entirely upon the rainfall all along. The snow fall is frequently taken up in the river before the rains begin.

I don't know that I ever heard anyone advocate the prevalence of the doctrine of riparian rights in this Territory.

It would materially affect the amount of water avilable in
4197 Eddy county if the people of Chaves county, lying just north, should be given the right, and should exercise it, to take all of the flow of the Pecos river where it crosses the line between Chaves and Eddy counties. (Objection by defendants.) If they should so take all of those waters at that point, there might be an un-
4198 derflow still to the river. It is not beyond possibility. (Objection by defendants.) The river bed is not of solid rock so that there could be no underflow. If the people in the county above should take all of the water as last stated, it might
4199 seriously affect the irrigation projects we have named. (Objection by defendants.) If you put it all in a bucket there
4200 would be none outside of the bucket.

In some instances that I have observed of the water that was used for irrigation, fifty per cent. was lost in seepage and evaporation and leakage—straight out leakage through defective construction. Plant life requires but a small part of it; but the evaporation will be very materially affected by the weather. I have known under evaporation tests for two consecutive days that
4201 the evaporation one day would be twice or three times as

great as the other. Different crops require different amounts
4202 of water. On the surface of water in a reservoir, supposing there was no water lost by seepage, absorption in the ground
4203 or drawing off through any conduit of any kind, the loss by evaporation amounted to between sixty and seventy-five inches in the course of twelve hours. The atmosphere here during the summer season is very dry and clear. The average precipitation through this part of the Territory, as far back as I have been able to learn from the records, was 15.99 inches. This average was for eight years. It is safe to say that the precipitation in this part of the Territory is about 16 inches annually and in higher parts of the Territory is probably a little more.

Cross-examination on behalf of defendants.

By Mr. DAWSON:

I know as a matter of fact that there is such a thing as return or seepage waters from the irrigation of lands. The only studies
4204 I have made on that subject have been in this vicinity, and each system we have here varies even in the return waters. Probably in no point of the Pecos valley that I know of is there over twenty-five or thirty per cent. that we could trace absolutely to return waters, although I have no doubt there are places on different soils where it is greater. But up to that percentage I think we have been able to trace the return waters. Perhaps the best illustration of that is in the Carlsbad district. A portion of that land is very sandy, and it requires a great deal of water on the surface, and it leaches out and returns very rapidly. The stream right at Carlsbad, right as it passes through the town, the normal flow, is considerably greater than it was before that system was put in. These return waters move slowly through the soil and at different velocities in different soils. It has a tendency to equalize it for the pur-
4205 poses of irrigation. For instance, previous to the construction of the irrigation system at Carlsbad the flow at Pecos city, Texas, was quite small at some times, as small as it is now above Carlsbad in the river, probably sixty or seventy cubic feet per second of time. But since the construction of this system and the return of waters from the irrigated lands—from the farmed lands—and possibly waters returning from the reservoirs that are seeping back into the soil and rocks and everything has increased the flow of the Pecos at Pecos city very materially. That is about ninety miles below Carlsbad, by railroad, and of course by the river it is more than that. The irrigated lands along the Pecos extend only about the first twenty miles from Carlsbad, so that after you have passed that twenty miles you then have seventy miles of river which is practically in its original condition so far as the lands lying on either side are concerned. I should say that the flow during the dry time of the year has been increased at Pecos since the lands about

Eddy—now Carlsbad—have been under irrigation. It has
4206 at least doubled; perhaps more.

The stream never goes dry at Pecos since the irrigation began. There is only one system of any considerable size along the river in Chaves or Eddy counties; that is, there are two dams on the one system and they are probably ten or eleven miles apart. There are times when all of the water of the river is taken out at the upper dam. The dam makes the reservoir. The dam is across the valley of the Pecos proper and it just simply stops the river, and it is true that when all of the flowing water in the stream is stopped at this upper dam, we find a good flow of water in it at the lower dam. There are no lands between the upper and lower dams
4207 under irrigation. That water that is found in the river entering the lower dam or Lake Avalon is from numerous springs. Some of these springs were in existence before the construction of any dam; others have sprung into existence since the construction of those dams; and it is quite perceptible to-day—the difference in the flow of the river between the time when the upper dam was empty and when it is full, showing that there is water percolating constantly through the earth and through the rocks and replenishing the river below. The rains in the valley of the Pecos are apt to be torrential, so that this river at all times has a very excessive amount of water in it and at other times it has a very small amount. It is important in irrigating to increase the minimum flow—to keep up as high as possible the flow during the dry season of the year, the greatest demand for irrigation purposes
4208 coming in the month of June in this country. The storage of water and the irrigation of these lands have a tendency to maintain the flow during the dry season and thus equalize the flow of the stream the year round. I could say in illustrating that point that when there was sixty-nine cubic feet per second flowing into Lake McMillan the irrigation system was drawing out of the reservoir four hundred and fifty feet per second for use in irrigation.

There is not a large proportionate part of the drainage area of the Pecos that lies in the high mountains where the snow fall is heavy, and there is not any considerable amount of land on the Pecos above Chaves county irrigated. There are small systems there—private ones. A large proportion of the lands are to be found mostly in Chaves and Eddy counties. There are a few in Leonard Wood county and the counties above, but they are irrigated not from the Pecos proper but from a tributary.

The snows which fall in the mountains, taking one year with another, are of very little value to this end of the river. The snows go off gradually and earlier than the rains come, and they
4209 are lost in various ways—by absorption through the sand and by perhaps percolating into a loose stratified formation of rock, and by evaporation. If by chance an early rain comes and moves the snow with that rain then we have "something doing" down here at once; otherwise we get very little of it. There are

stretches of the Pecos river above Roswell where the stream shows no flowing water on the surface during dry times of the year, and that is true independently of the waters of the stream being taken for irrigation. This stream is a perenniel one where it comes down out of the mountains. There are times when there is flowing water in the mountains along the course of the stream through those mountains that you may find dry stretches below, independently of the water being taken out for irrigation. For illustration, from
Santa Rosa, on the Rock Island railroad in Leonard Wood
4210 county, to what is known as Cedar cañon or Post-office glen,
the flow there is perenniel. It never ceases. And at the same time a few miles below this glen it is frequently in the dry seasons absolutely dry on the surface of the bed of the river and there is not a drop of water taken out in that stretch for irrigation, and as you proceed down the river when you reach Salt creek and Bitter creek again, which is fifteen miles above Roswell and fifty miles south of the glen, it again becomes a perenniel stream and has never been dry within the knowledge of anyone. The Pecos is one of that family, such as the Rio Grande and the Arkansas, and those streams which proceed out from the mountains onto the plains and are lost and again take up their course as they get into more humid regions. That family has some characteristics that quite distinguish it from the streams of the eastern or middle States; that is, it is
quite apt to be the case. I can cite another stream that dis-
4211 appears in the same way in the Territory of New Mexico.
That is the Mimbres. That stream is over in the western part of the Territory and flows through or by what is the town or city of Deming. It rises in the mountains and flows through the Black mountains and is called through there a perenniel stream so long as it hangs to the cañon or narrow valley. When it leaves it it disappears. The soil is loose and sandy, and even floods that rush down this cañon to the extent of destroying homesteads and people are lost entirely, because the Mimbres river has no mouth.

To generalize, it is true that all of this part of New Mexico—Chaves and Eddy counties—is dependent for its prosperity, the maintaining of whatever development has already been made, and its hope for the future, upon water for irrigation, most assuredly.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

In speaking of the river below here, I will explain as to water escaping over the McMillan dam. It is a dam that if the water should escape over it it would not be there fifteen minutes. It is a
rock-filled, earth-apron dam. There is water allowed to pass
4212 through the gates and through the spill-ways that at times
of high water will allow it to escape. There are times of the year when none passes over or visibly around the dam. The river below the dam is not as large as it used to be. Not imme-

diately below. It is my experience that if you take all of the water of the river there is not as much below as there was if you had not taken it. If I drink up a glass of water there is not much left. If you take the water out of the river and take it back onto land for the irrigation of it and one-half of it or one-fourth of three-fourths of it evaporates and goes into plant life, the part that evaporates and goes into plant life certainly does not tend to supply the flow of the river below.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

4213 The heaviest rain storm I have seen here, I think, was six and a half inches. That fell within thirty-six hours. I have seen a torrential storm fall three-quarters of an inch in twenty minutes. No, the rains we have here, not being distributed, are not of much account so far as the use of the water for the cultivation of crops is concerned. I have seen two inches of rainfall fall so quickly here and so rapidly that it did not produce as good results on plant life, on crops, as half an inch falling in a longer time and coming gently, with no run-off, for of the two inches a large per cent. of it was run-off—was gone.

There is a reservoir being constructed near the town of Roswell under the provisions of the reclamation act. There are 10,000 acres of desert and unproductive land set aside for that reservoir to irrigate. This reservoir is known as the Hondo system.

Recross-examination on behalf of defendants.

By Mr. DAWSON:

4214 I have made some investigations as to the flow in the Pecos river below the irrigation systems about Carlsbad and in the Rio Grande river below the mouth of the Pecos, and the largest amount was made during the contest or suit of the United States against the Rio Grande Dam & Irrigation Company, known as the Elephant Butte suit. At that time I investigated the Rio Grande from El Paso south as far as the mouth of the San
4215 Juan river, the last tributary that enters before the river flows into the Gulf. I examined all of the tributaries both on the Mexican and the American sides in that distance. The conditions of the river as existing before were obtained by me from visits to the inhabitants along the river, and their testimony as to the water marks, high and low, and every thing connected with a case of that kind, and the most authentic and reliable sources of information were to the effect that the floods were probably not as frequent or perhaps on an average not so great as previously, but that
4216 the minimum or rather the perenniel flow was increased to some extent. Not greatly, because it was a long way off from the source of any irrigation plants, but evidently it was not lessened

anyway. And my investigation developed the fact, especially on the Pecos, that the irrigation of lands along it and the Rio Grande tended to equalize the flow of the stream or make it a better available flow. I might say that the Pecos below Carlsbad has a greater efficiency for irrigation purposes than she had previous to the construction of that irrigation system, unless storage reservoirs were resorted to at points farther down.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

In the Pecos valley through the counties both ways from this place our irrigation is by both reservoirs and direct irrigation. The canals that divert the water through storage and then through other canals from the reservoirs are probably fifty times as the direct diversion without storage.

4217 J. W. POE, Roswell, New Mexico.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside at Roswell, New Mexico, and am president of the Citizens National Bank of Roswell. I have lived in the town of Roswell since 1894, and in what is now known as Chaves county since November, 1886. I first came into this immediate vicinity in April, 1881. This county was then known as Lincoln county. For several years
4218 I lived near Fort Stanton, west of here. When I first came here there was about 150 to 200 acres of land under irrigation in what is know as Chaves county. I should say there is now under irrigation in this county from eighteen to twenty thousand acres. I reclaimed land by irrigation after I came here, probably approximating six to eight hundred acres. I was connected with the Roswell Land & Water Company and the Pecos Irrigation & Improvement Company that were developing land by irrigation. These companies I should estimate reclaimed by irrigation about eight to ten thousand acres since 1881. Before this land was irrigated it was worth nothing except for pasture. It was probably worth $1.25 per acre, some of it, and some of it not so much. It is worth now from $40 an acre upwards, according to location and the state of improvements. Some portions that are in orchards would be worth several hundred dollars an acre.

When I first came here there were no trees to be seen in
4219 this locality with the exception of a scrubby growth on the banks of the Hondo, consisting of hackberry and scrubby elms, probably averaging from twelve to fifteen feet in height—perhaps not over ten—and some little tree planting, such as cottonwoods and the like down so heast of here about six miles at the

old Chisum ranch. At the present time there are many thousands of trees in and around Roswell, independent of fruit trees, such as the cottonwoods. Portions of this county in this vicinity, so far as shelter and protection from winds and the influence the tree growth might have upon the climatic conditions are concerned, is equivalent to a forest, almost. I should think there were about three thousand to three thousand five hundred acres in fruit trees
4220 within a radius of fifteen miles of Roswell. This tree growth, both cottonwood and fruit trees, has been produced by irrigation, so far as I know. The tree growth here could not have been produced to amount to anything without irrigation. In respect to the effect this tree growth has upon climatic conditions, in my opinion the tree growth, the foliage, has had a tendency to temper and neutralize to some extent the effects of the dry atmosphere. And that is my own experience. That is, there seems to be some more humidity, and so far as my own observation goes I believe the health conditions for some people are better nearer in and around this timber than away from it. We have a zephyr here occasionally. It tends, of course, to break the force of the winds very greatly, and in some places in this vicinity during the worst wind storms we have you can hardly realize there is a storm on the outside, from the protection the trees afford.

Assuming that the assessed valuation of property in this county is in the neighborhood of $3,000,000, and that is only one-
4221 fifth of the actual value, I should say that from sixty to sixty-five per cent. has been created by and depends upon irrigation. The stock interests are very large here, but they would not be so much if it were not for irrigation in the valley. To some extent the live stock interest depends upon the irrigation in the valley. There was no railroad when I came here. The Pecos Valley & Northeastern was built from Pecos in Texas to Carlsbad—it was then called Eddy—and in 1894 was extended to this point. The inducement which brought the railroad here, as I understood the situation, was the prospect for the fruit growth by means of irrigation and development by that means. I think that was the only inducement there was, or practically all, to build a railroad in here.

In a general way, I have given some thought and study to the amount of lands which may yet be reclaimed by the waters we
4222 have here. From this visible supply of water and from storage I should think the acreage could be increased from seventy-five to a hundred thousand acres. When I first came to Roswell there were about twenty-five people here, and probably one hundred and fifty in the vicinity and for miles around. They were ranchers. We now have approximately 6,000 within the limits of Roswell. This population here depends mainly on the irrigation of the lands.

There were no banks in Roswell when I came here; we have
4223 three national banks now. The last report of the comptroller, about the 11th of January, showed somewhere from $700,000

to $725,000 on deposit in these three banks. I have not the exact amount. Conditions in Eddy county, the county below here, are similar to those in this county with respect to property and the manner in which it has been created.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

I have had something to do with some of the irrigation interests here. We took the water from the Spring rivers. We have two Spring rivers here—the North and South Spring. We took the water directly from these springs and not from any reservoirs.

If after we had gotten our system all established someone had just gone above us on those streams and taken all of the flow, that would have deprived us of water for irrigation, if they had
4224 taken the whole supply, and it would have ruined our project if they had taken it all. I don't think it would have satisfied us and supplied us with water for such parties above us simply to say "You will get the return waters from my irrigation some time in the future." (Objection by defendants.)

Cross-examination on behalf of defendants.

By Mr. HAYT:

4225 I resided in western Texas immediately before I came to this Territory. I was engaged in farming some little in Missouri, and Kentucky, my native State, and I know something about the conditions concerning agriculture there. In a general way, I should say an acre of land here properly irrigated would produce nearly if not quite as much as three times what an acre would produce in Kentucky where I was born and raised, twice to
4226 three times as much, and in value more than that. I am speaking now of crops produced here under irrigation farming as carried on at the present time, and I believe that this could be greatly increased by what is known as intensive farming by irrigation. We have some instances here of intensive farming where the land owner is cultivating a small acreage in fruit or in crops that require great labor, such as celery and some other things of that kind, and I think under favorable conditions as you have stated twenty acres of land will support a family. I think I know of instances here where a less number of acres than twenty are now supporting a family of five. It would be possible by care-
4227 ful cultivation in this vicinity with sufficient water for irrigation, that a family of five could be comfortably supported upon ten acras if they were near a good market and applied the proper judgment as to the kind of crops, etc. I believe it would be possible to support a family of five on ten acres. I am inclined to think this will be the result of improved methods of farming and

horticulture in this community. Something approaching that ultimate result.

The assessed valuation of this property approximately is about $3,000,000, something over that, and I should say that that is thirty-
five to forty per cent. of the cash value. I think the railroad
4228 company is the heaviest tax payer in the county. As I understand it, that portion of the railroad from Roswell north under some act of the legislature was exempted for a certain number of years from the time of its building—five years—from taxation. My estimate, made on short notice, is that sixty per cent. of the property in this county in value is the result of irrigation. These lands that have been reclaimed by irrigation have been irrigated from the two Spring rivers and the Berrendo and the Rio Hondo in this county. They are tributaries of the Pecos.

4229 S. ATKINSON, Roswell, New Mexico.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside in Roswell. I am claim adjuster and land tax agent for the Pecos Valley & Northeastern, or the Pecos lines. I am also in the abstract and land business. I have lived in Roswell since 1898. I lived in Eddy formerly. The assessed valuation of Chaves county for 1904 as made by the assessor and passed by the board was $3,004,822. There was added to that by the assessor what they call "additionals" which approximates $50,000. In this county
the railroad from here to the State line is exempt from taxa-
4230 tion. About fifty-four miles of it is in Roosevelt county. By statute, railroad property is exempt from taxation for six years after the railroad is built, and this road was finished in February, 1899. That part of the railroad that is taxed in this county is assessed at $3,500 a mile. This valuation does not represent the true value. The assessed valuation in the county represents about thirty-five per cent. That would be a big estimate. I should think there are twelve millions of property in Chaves county.

I am familiar with the conditions prevailing in this county as to its irrigated land and what that property and valuation depends upon. I should say seventy-five per cent. of this property is dependent directly and indirectly upon irrigation. Ninety-five
4231 per cent. of the population in this county is dependent upon irrigated lands. I am acquainted with the conditions in Eddy county. I have made an abstract of the lands in that county and know the lands under irrigation there. I should say that a little more of the property in that county has been created by and depends upon applying the waters of the Pecos and its tributaries to the lands for the purpose of raising crops. We would not have much use for a railroad here if we did not have irrigated lands.

The railroad was induced to come here entirely by reason of the irrigation development and the irrigation of the lands or the possible irrigation of the lands. The whole length of the line is 370 miles from Pecos to Amarilla.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4232 Our property interests are largely dependent upon irrigation. If some one just above us should take all of our water it would, except in flood times, deprive us of irrigation almost entirely, with the exception of the little seepage water we could get. (Objection by defendants.) We could not retain our present civilization, our present property and our present values simply upon the theory of return or seepage waters to the extent it is to-day. (Objection by defendants.) This would not ex-
4233 ceed ten or fifteen per cent. (Objection by defendants.) Taking the waters above us for irrigation and applying them in some other county or some other State would more or less affect our interests in this part of the Territory. (Objection by defendants.)

4234 WILLIAM G. HAMILTON, Roswell, New Mexico.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I have resided in Roswell since 1898, and before that resided in Carlsbad, New Mexico, or what was formerly called Eddy. Before coming to New Mexico I resided in the San Luis valley in Colorado for ten years. In that valley I was engaged in the construction, maintenance and operation of irrigation works. After I came to New Mexico I was assistant general manager of the Pecos Irrigation & Improvement Company and general manager of the Roswell Land & Water Company, and afterwards general manager of the Pecos Irrigation & Improvement Company. After I came to
4235 Roswell in 1898 I had charge of the Roswell Land & Water Company, an irrigation project, the canal now known as the Feliz Irrigation Company's canal, the Pecos Valley and Orchard Company, and other enterprises. These different companies that I have been connected with in Colorado and New Mexico were all engaged in the development of lands by irrigation. I have had twenty-one years' experience in this business. There are some twelve to fourteen thousand acres of land, I think, under cultivation in Eddy county, New Mexico, by irrigation. The water is taken from the Pecos river to irrigate this land. In Chaves county there is approximately from seventeen to twenty thousand acres irrigated. The lands in neither of these counties could produce crops

from one year to another without applying the waters of the streams to irrigate them. If you should deprive these lands of the water they now have they would not be worth to exceed $1 an acre.

4236 It has been agreed by competent authorities here that approximately 100,000 acres in addition could be irrigated and put under cultivation in Chaves and Eddy counties with the waters that are at the disposal of the people here, in these different streams, and by reservoirs or by impounding them in reservoirs. The majority of that land now is worthless except for grazing purposes. Were it irrigated under a reasonably good system it would be worth $40 to $50 an acre on an average. This 100,000 acres would easily increase the population a thousand per cent., including towns, etc. The crops which the land here is adapted to produce and which it does produce are alfalfa, fruit, Indian corn, the various families of kaffir corn and unsaccharine sorghum, and all sorts of vegetables, sugar beets, celery, can-

4237 taloupes, grapes, peaches, apples, pears, prunes, cherries, etc. I know of one man here who makes a living for himself and family on three acres of land. I should judge the average is twenty acres for a family of five. We could not raise ordinary trees here for timber and lumber purposes without irrigation. There is in the neghborhood of 2,500 acres of land in orchards here. A five year old apple orchard here is worth $500 an acre.

The rule here is to take the water just as far from the

4238 stream as the contour of the land will permit. If we were confined to lands bordering on the stream, say forty to eighty acres back, it would absolutely destroy our system of agriculture.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

Some of our ditches or canals take the water from the river in this particular locality back as far as seven miles. Our fruit interests here are in a very high state of cultivation. Apples, peaches

4239 and pears took some of the highest premiums at the Columbian Exposition. If some one should go above us on the stream and take all of the water that we now use for irrigation, its effect upon the stream below depends a good deal on the stream. If they should take all of the water out of the Pecos river a few miles above here it would have no effect, in my opinion, on the supply of water in Carlsbad and below there. We dammed the Pecos river twice and absolutely shut off all the water, and yet there is a larger supply below at the period of low water than there was previous to the dams being put in, at the present time. This is anywhere from the town of Carlsbad to Pecos City, which I believe is the lowest point at which any measurements have been taken. From my observation I know that the flow of the river has increased at least a hundred per cent. at low water fifteen miles below Carlsbad. We

4240 dam the river and shut off all the water supply. The water does not begin to rise to any appreciable extent for five or six

miles as the river runs, and below the dam the river is not absolutely dry. There is no place where you could cross it dry-shod. That water comes below the dam from seepage. But where the seepage comes from no one is absolutely able to tell. It comes from some point on the Pecos, either from the reservoir, or, following the limestone strata, from above the reservoir. By building our big reservoirs we store the surplus water and we find that to be a profitable,
4241 economical and suitable method. If there were no reservoirs and all of our irrigation depended solely upon the ditches and the ditches simply taking their water from the surface flow of the Pecos river, then if somebody should take all of the surface flow of the Pecos river above, that would have an effect upon the river below but would not destroy it in that stream. (Objection by defendants.) This is because of the great underflow. There is an underflow in the Pecos river. It would not affect the underflow. They have not yet devised any system to take all of the underflow, but if they should take all of the underflow out of course it would
4242 destroy the value of property.

The climate here is dry and arid, and our precipitation is about 16 inches on the average, I am told. I don't think, myself, that it is so great as that. I have never kept the records, except at Carlsbad, and for ten years the highest we had there was thirteen inches. It is probably higher here, because we have a great deal more timber now.

Cross-examination on behalf of defendants.

By Mr. HAYT:

I have had twenty-one years' experience in irrigation. I commenced about the year 1884, in May, in the San Luis valley in Colorado, and we took the water from the Rio Grande. The enterprises I was connected with were known as the Citizens' canal, the Del Norte, the San Luis and the Empire—four canals which were building simultaneously under the same management. The Del Norte at the headgate was eighty feet on the bottom, running down
4243 to twenty, I think, in the course of forty miles. The Empire was ten miles lower down the river and was of the same size, and the San Luis forty feet. They were under construction when I went to work in 1884. I believe they were begun in 1882 and were completed about 1888, but they began farming under them in the spring of 1885. They did not begin to take any considerable amount of water until 1886 or 1887. The San Luis valley is really a park about one hundred and twenty miles long and sixty miles wide, with a very slight fall from the northeast to the southwest not to exceed ten feet to the mile. It is surrounded by mountains on either side, and the Rio Grande breaks through a narrow, rocky box-cañon at the extreme southeast of the valley. I believe that geological history says it was once a lake. The drainage is all into the
4244 Rio Grande through the cañon into New Mexico. The water level is very near the surface of the land. I noticed the

seepage from irrigation in the San Luis valley at Alamosa, which is probably fifteen miles below any of the large canals, and whatever seepage water there is in that valley must flow through the cañon below. The company that I was with in the last years I had charge there put down not less than a hundred artesian wells, and it was demonstrated by sinking those wells that there was a solid limestone formation all over, a rock formation extending throughout the valley, and the soil was of the character of an alluvial deposit
4245 on top of that. We would strike different water courses or bodies of water almost to the surface as far down as we went. They began at about fourteen to twenty feet. The mountains that the Rio Grande drains have been almost denuded of timber. At one time there were very heavy forests everywhere and now the mountains are nearly all bare.

I don't know from personal knowledge in regard to the snow fall in late years, only from newspaper reports, but I know that the snow fall in the last ten or fifteen years has not been available for irrigation for any length of time. On account of the timber being cut from the mountains the snow melts all at once and comes with a great rush, and we have floods in the Rio Grande, whereas formerly, when I first went to the country the snow water would last sometimes until September. Now it is all gone in June. All of the timber from the headwaters of the Pecos is absolutely gone now. I don't think there is any timber anywhere along the course of the Pecos or any of its tributaries. We receive no benefit here from the melting snow along the area at the headwaters of the Pecos
4246 river. The flood waters that are stored in the reservoirs here come during the local rainy season and not from the snow. We get our heaviest supplies of water in May, June, July or August when there is rain in the valley and in the territory immediately adjacent. The floods in the Pecos river at this point come from rain almost entirely. The most destructive flood we ever had was when it rained the entire length of the Pecos from Colorado to the Texas line. There are three dams across the Pecos—two belonging to the Pecos Irrigation Company and one being an enterprise owned by the Public Utilities Company, I believe, in Carlsbad—a power dam. Those dams are so constructed as to take the flow of the water in the river so far as possible. They are absolutely tight. And all the water that escapes from the reservoirs is under control and is used for irrigation, except in flood times when it
4247 passes around over spill-ways constructed for that purpose.

At six miles above Carlsbad, at Lake Avalon, there is an absolutely tight dam, and the river is turned into the canal. There is absolutely no flow there below the dam. Six miles below in the bed of the river, with no other supply except from some spring or seepage, there is a power dam across the river, and they run an electric pumping and water service, and all that from the power generated from this water. That will give you some idea of the flow at this point. That water all rises within six miles. And I know that

the river continues to increase below. Twenty miles below that point there are some tributaries coming in to furnish a supply in the ordinary season. The Black river would be the first one,
4248 which is a very small stream supplied by springs. The best place I have to judge from my own personal knowledge is at a point where we had a dam across the river eighteen miles south of Carlsbad. That is twenty-four miles from the last reservoir; a dam belonging to the Hagerman Land & Improvement Company. There is at that point now more than double the amount of water running that we had when we first constructed it in low water at the lowest time of the year, and that difference in my judgment is to be accounted for altogether by the seepage from the irrigated lands above, and I am sure that the amount of seepage water is increasing year by year. They have been irrigating there now for more than ten years, and underground channels have formed so that there are hundreds of springs that are perfectly invisible coming out of the banks below water. There are thousands of them that were absolutely unknown in the early years of the development of that enterprise.

4249 It would have been impossible to create or maintain any irrigation enterprises in any place I have ever been under the doctrine of riparian rights, for the reason that nearly all of the western streams—the streams in the arid country where it is necessary to irrigate—are subject to torrential rises and the land immediately adjoining the river almost everywhere is submerged once or twice every year, and sometimes more, according to the rainfall and snow fall and their locality. Taking the Pecos river and the local conditions here, at one time a few months ago all the river bottom anywhere in Eddy and Chaves counties was under water for two weeks; and not only that but nearly all of the river bottoms were rough. The land is not susceptible of irrigation, because it has been cut so much by floods at different times for centuries that the lands along the immediate banks of the river are never smooth enough to irrigate without such an enormous expense that it would have
4250 put off any work of that sort for probably another century, and for this reason it would be necessary to carry these ditches back onto the higher lands even if you were only to irrigate the lands riparian to the river, because it is necessary to get above the land in order to get the gravity flow to cover them.

I know of one tract of three acres of land here that has supported a family for the last year or two and furnished a surplus, and that was planted to stuff that was used for making pickles—celery and such things. The man raised all the material on his three acres of land. He and his wife put the stuff up here and sold it in town, and they have made a great deal more money per acre than the people who have planted alfalfa on their lands in large tracts. It produced a net return of $600 per acre.

The measurements of return waters are very difficult in most localities. In the San Luis valley we were able to estimate them

quite accurately on account of the rocky cañon down below where the water went through, and at an early stage in the development of that country, when we had irrigated but eight years, the Government engineers estimated that sixty-five per cent of the water diverted from the stream had been returned to it by seepage, and from my experience I know that the return water is large.

4251 Cross-examination on behalf of defendants continued.

By Mr. DAWSON:

My observation has shown me that the taking out of the waters in the San Luis valley at a time when the river was high has increased the flow of the water in the low period through the cañon down near the New Mexico line at the time of the year when the stream was naturally low, and that is about July and August. The flush time in the San Luis valley in the Rio Grande is May and June, and that is the time of the heaviest irrigation, and during the flush time the waters in that river are greatly in excess of what are spread over the valley. The amount spread over the lands during
4252 the flush season is a great deal in excess of the normal flow in the river in the dry seasons. I should think there is four or five times as much water used in the heavy irrigating season as the normal flow of the river at low water, and I know of my own knowledge that if the return waters as shown by measurements are sixty-five per cent. of that diverted from the river the comparative flow of the river in the dry season at the cañon since irrigation has been practiced is very much larger than it was before. There is no natural flow in the Berrendo and the Hondo rivers from which the Northern canal takes its water, except from the return and seepage waters and the flood waters of the Hondo; but the latter is only used on rare occasions, and aside from those rare occasions that canal draws its water from the return or seepage waters, and it irrigates seven thousand acres of land.

4253 Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

My recollection is that there are eight large canals in the San Luis valley. There may be a good many more now. Supposing those canals are located so that the one uppermost, No. 1, coming down the river, during irrigating season and during the dry season of the year, would take all the water of the river, and then the next one was located below the point where the return waters from No. 1 would get back to the stream—and that condition has happened up there very often—then No. 2 will not get as much as though No. 1 were not in existence. If No. 2 again takes all of the water that goes past or through or around the dam and all the return waters from No. 2 return to the river above the headgate of No. 3, then

No. 3 will certainly get less water than though Nos. 1 and 2
4254 were not in existence. If these conditions should be repeated, certainly you would get less water each time, and under these conditions indicated each of them on down the river would get less than it would have gotten of those above had not been in existence.

4255 The return waters that would flow finally into the cañon from the San Luis valley would be from the whole country. It would find its outlet along the lowest point. The amount of waters that flow into the cañon comes from the waters which are spread out all over the valley. The canals run in different
4256 directions; they do not all run parallel. If all the water is taken by the lowest canal and all of the return waters return to the river above the mouth of the lowest canal, I am not
4257 able to answer your question as to how much will get into the cañon. If you have a series of canals along a stream that is not supplied by tributaries and each one of them is located down the river below the one above so that the return waters from the one above get back into the river above the mouth of the one below it, the amount of water that is left in the river below the lowest canal, when each of them is taking the full flow, is simply the amount of return water from the lowest canal, when it is all taken out in that way. That never has happened in my experience.

Recross-examination on behalf of defendants.

By Mr. DAWSON:

I have never known of any conditions, geographical or topographical, that correspond to the set of hypothetical questions that counsel has just been asking me. That is not the condition as it
4258 exists in the San Luis valley at all. These return waters that I spoke of in answer to his question were largely made up of waters which were taken by the canals at a time when the water was flush and there was a surplus in the river for all canals; so that the return waters which are flowing at the time of the dry season are not necessarily the waters that are simply coming back from the lands to which waters are being applied at that identical moment by canals above. In some cases it takes years, and did in that valley, for the waters to find a channel to the river; and aside from all possibilities based upon hypothetical conditions, which I say do not exist, it is my observation that during the period of low water in the river the flow of the stream at the cañon where it leaves the San Luis valley is better maintained and carries more water than before irrigation was commenced in the valley. It carries a great deal more water.

Recross-examination on behalf of defendants continued.

By Mr. HAYT:

4259 It is the universal practice in the Pecos valley to carry the canals to the highest possible contour line in order to take in as much territory as possible, where the water supply is sufficient. The expense, proportionately to the acre, would be a thousand times greater if the canals were built simply for the purpose of irrigating the riparian lands, and it is true that by reason of this great expense it would be impracticable to construct canals for the purpose only of irrigating riparian lands.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

The Pecos river is an inter-State stream. It rises in New Mexico and flows into the Rio Grande in Texas. If Texas should insist upon the application of the doctrine of riparian rights on the Pecos river in Texas, and that should be sustained, it would almost absolutely depopulate Eddy and Chaves counties and destroy all except the cattle and sheep interests on the range, and there would be no future development and prosperity.

4260 I am well acquainted with what is known as the arid region. The doctrine of riparian rights is not applicable to any part of the arid region where land can be irrigated.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

If the civilization of Texas had been built up long prior to any irrigation on the Pecos river in New Mexico, as to whether it would be right to take the waters in New Mexico, although it entirely destroys the civilization that was prior in time below on the stream and located in Texas, I will say that under the laws in force in this country relative to the use of water for irrigation it would be impossible for us to divert the water already applied on land and so destroy their civilization. I would not think it right, however, to destroy a prior civilization by a diversion made subsequently.

4262 VERNON L. SULLIVAN, Roswell, New Mexico.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside at Carlsbad and have resided there nearly two years. I am a civil engineer and have been engineer for the Pecos Irrigation & Improvement Company for about twenty-one months. This com-

pany is engaged in irrigation. I had no experience in irri-
4263 gation prior to coming here. Since coming here I have gone over the works and investigated the improvements of that company. They have a reservoir at McMillan called the McMillan reservoir, about eighteen miles above Carlsbad, and another about six miles above Carlsbad called the Avalon reservoir. Lake Avalon was partly washed out last fall. The improvements I have mentioned cost somewhere near a million
4264 dollars. There are nearly fifteen thousand acres of land irrigated from the system owned by the Pecos Irrigation Company.

4265 FRANCIS G. TRACY, Roswell, New Mexico.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I have resided in Eddy county, New Mexico, at Carlsbad, formerly Eddy, for fifteen years. When I first came there, after a month's work planting trees and something of that kind I went to work for the Pecos Irrigation & Investment Company, which was the predecessor of the Pecos Irrigation & Improvement Company. I am now president and general manager of the Pecos Irrigation Company, which is the successor of the Pecos Irrigation & Improvement Company or Investment Company. I have held that position since February, 1900. I have been engaged in irrigation in connec-
4266 tion with the company since January, 1890. I have also had personal experience in Eddy county in respect to irrigation. I have farmed individually, one way and another, nearly every year, several hundred acres, and am engaged in fruit growing down there. When I came in, the irrigation works were in course of construction. The dam at Lake Avalon was not yet completed, and there was no railroad at all. We now have a railroad from Pecos City through Carlsbad to Roswell and Amarillo. It starts in Pecos, Texas, and ends at Amarillo. Its length is some four hundred miles. The area in cultivation when I first came to Eddy county was very slight indeed. There was no irrigation from the
4267 Pecos river to speak of.

The average rainfall in Eddy county is variously stated at from twelve to fourteen inches. I think twelve is nearly right. That is not sufficient to raise a crop without irrigation, not in the way the rains come. They come in the form of torrential rains generally and at an uncertain period. There are never two years alike in reference to that. At the present time I would estimate that throughout Eddy county there must be from twenty-five to thirty thousand acres under irrigation. Of this about fifteen thousand is in actual crops, of which fourteen thousand is under the main system of the Pecos Irrigation & Improvement Com-
4268 pany of which I am president. No sir, that amount of land could not be watered from the waters of the Pecos river withou

a reservoir system. The estimated cost of the improvements now owned by the Pecos Irrigation Company is in the neighborhrod of a million dollars.

By using the unused waters of the Pecos river and reservoiring the flood waters, my opinion is that possibly sixty or seventy-
4269 five thousand acres of land could be irrigated. Of the land which can yet be irrigated, between twenty-five and thirty thousand acres is Government land. It would not bring the Government price before it is reclaimed. The land that has been reclaimed by irrigation in Eddy county is worth about $50 an
4270 acre. The Government land which can be reclaimed by the waters of the Pecos river and by storing the flood waters is worth at the present time about $1.25 an acre. When reclaimed it would be worth as much as the land which has already been reclaimed. This land if reclaimed would support ten times the population of Eddy county as it is to-day. The population to-day is in the neighborhood of five thousand, I think.

I think I have some idea of what constitutes the doctrine of riparian rights. No sir, the land which has been reclaimed in Eddy county, New Mexico, could not have been so reclaimed if that
4271 doctrine had been enforced on the Pecos river. We take every drop of water out of the Pecos river, except at flood times, six miles above the town of Carlsbad. We carry the water some thirty miles from our reservoir, and our works are constructed forty miles, and back from the river nearly six miles.

No sir, if the area irrigated from the waters of the Pecos river were to be limited to the lands riparian to the river, that is to say, the first or second 40 acres from the river, it would be practically impossible to make any development on the Pecos aside from the pumping development if they limited us in that way, owing to the high banks of the river and the difficulty and expense in getting the water up. I should think fully eighty per cent. of the property in Eddy county has been created and exists by virtue of the taking of the waters out of the river by this reservoir system and applying them to the lands in the county for irrigation purposes.

The railroad from Pecos to Amarillo was built entirely be-
4272 cause of these irrigation possibilities and was begun by the same people who are interested in the irrigation and was practically completed by those people. No sir, there was nothing else in either of these countries to induce the railroad to come in aside from the development that could be made by irrigation.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

As to the extent of our irrigation from reservoirs, it is very difficult to answer definitely. We could not do anything at all without the reservoirs. The fact is that our irrigation in Eddy county is almost entirely dependent upon the system of reservoirs. We could

not maintain the land we have in cultivation down here to-day, even in small area, if the water taken was taken directly from the Pecos river. The reservoirs are built directly in the Pecos river by
4273 dams across the river and every drop of water taken out of the Pecos river at certain times of the year is impounded. We store the winter flow of water for use in the following spring, the winter and spring generally being the dry time. Unless the water down the Pecos or the flow is large after an unusually rainy fall, we stop all the flow during the winter months for storage in the spring, and that continues until the rains come some time during the summer. Immediately below the dams there is practically no water at all. By this system of reservoirs, the impounding and holding back of the flood waters, we are able to increase the amount very largely over what we could get directly from the river, and if the flow of the river below has been increased it is because of the holding back and impounding and storing of the flood and excess waters during the times when there are flood waters. If our
4274 irrigation to the full extent of the capacity of the valley were directly from the river, having no reservoirs, making no storage whatever and taking all of the water from the river for our irrigation, it would decrease the flow very much indeed.

If someone should claim and exercise the right to take all of the water of the Pecos river above us and we were limited for our supply of water to the flowing waters of the Pecos river, we would not have any left. We would have to starve. (Objection by defendants.) If that were done we would have to stop business altogether, and it would ruin us. (Objection by defendants.)

Cross-examination on behalf of defendants.

By Mr. HAYT:

4275 Except in times of flood we take all of the water out of the Pecos river a few miles above Carlsbad, and at such times as there are very large natural springs in the Pecos just above the town of Carlsbad between our dam and it there is always a constantly flowing stream at that point—a constant minimum flow. When our company and others store water along the Pecos river, of course when the water is used above there there is nothing like the flow above Carlsbad that there is when the water runs down there unobstructed. In a measure, I believe the storage of water in reservoirs and the use of it in irrigation has a tendency to equalize
4276 the flow of the streams below. A portion of the water which is lost from our reservoirs by reason of seepage and leakage as well as from the ditches returns immediately to the Pecos river or can be visibly seen returning but as to what quantity so returns it would be hard for me to say. The use of the water in the manner in which we use it does not deprive the river entirely of that water; some of it gets back. The chief difficulty we have to encounter in conserving this water is the question of leakage, both from the reser-

voirs and from the canals. I have found by examination of the records of other companies that the percentage of loss from our canal is not greater than from the new companies of the West generally, except in California where there are peculiar local conditions affecting it so that the losses are in some way reduced to a mini-
4277 mum; but in our reservoir we have gypsum leaks, which of course are local and make the loss from the McMillan reservoir unusually large, and there are one or two gypsum spots at the lower end of the canal which furnish an unusual condition of leakage. In our case it has not been decreased because we are using clear water without any sediment, owing to our reservoirs, and it has been conclusively proven that we shall have to take some special means to prevent loss. If we were able to and should turn the water of the river in flood times into our ditches, I expect that that would serve very largely to stop up leaks and lower the percentage of loss. That has been the experience everywhere else. It is our endeavor during the winter and spring months to practically store all the water running in the Pecos river at our dams and use that water later in the season for the
4278 purpose of irrigating lands below there. If we did not store that water it would run on down the Pecos river. It would be of no use to anyone for irrigation purposes or anything of that sort but would practically be wasted. We store it in seasons when it cannot be used for direct irrigation and we use it in seasons when it is necessary to use water for the growing of crops. During the actual irrigation season very little of the water that we put upon the land returns to the river. It takes several months for the return flow to reach the river, but eventually a portion of it gets back into the natural drainage channel and goes on down the river, and in the early years it was true that that portion increased from year to year as the ground became saturated from repeated irrigations, but in later years I have noticed no increase. I think the ground
4279 has reached the point of saturation. I think there is no increase now. The farthest land irrigated is about six miles from the river. The greatest distance from the place at which the water is used and seems to return in the way of springs—I have personally examined that more than half way down through our system—is to a distance of about fifteen miles below Carlsbad or twenty-one miles below the reservoir. Below that I have no
4280 personal knowledge. I have noticed that for that distance new springs are coming into existence and the flow of water from other springs has been increased as the result of irrigation in that particular locality. I think there are very few of these springs that go dry during an ordinary time when we are keeping the water out of the canals. Our irrigating season, you know, is long, and we run water much more during the winter months than they do farther north, but ordinarily our canal is empty from three to three and a half months, and during that time there are very few of those springs that go dry. There is a small percentage of them go dry.

And these springs, after they once begin, so long as the irrigation is kept as a regular thing, have a continuous flow throughout the year. What I mean to say is that if the irrigation should permanently cease of course the springs would cease, but so long as irrigation is going on from year to year those springs are permanent springs. The
4281 irrigation has not ceased from the time we first inaugurated it, and those springs which came into existence have been flowing continuously from the time they first commenced to flow up to the present time.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

Yes, the return waters have not increased lately because the soil has become saturated to the full extent of its carrying capacity, and of course no increase could be had over that. If there had been any prior civilization on this river below Carlsbad and below our system then our system would affect the river down there and would affect their property interests.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

4282 They are irrigating lands in Texas below the territorial line from the waters of the Pecos. They tell me that at Barstow, Texas, they have under irrigation about ten thousand acres. They have a ditch there which they have been putting water out of in the last year or two, but the actual area in cultivation, I think, amounts to only possibly a hundred or two hundred acres. They contemplate, though, using it largely. Our dams in the dry season take every drop of the Pecos river at those points and turn it into our ditches. The lands in Texas must be irrigated partly from seep-
4283 age from our system and partly from the natural springs on the river. A great many of those springs existed there prior to our reservoir and irrigation system. They have increased since the reservoirs were put up and irrigation begun, but the percentage I couldn't tell you. Between the territorial line and Pecos they have taken out a large ditch to irrigate the bottoms below the territorial line. I have seen their prospectus, and from it they propose to irrigate several hundred thousand acres, and they depend upon the seepage waters of the Pecos river largely, and springs along the river, below our dam.

The assessed valuation of Eddy county for 1904 is $1,800,000. This is about one-third of the real valuation. Our irrigation system is exempt from taxation. About eighty per cent. of this valuation is dependent upon irrigation. No, the railroad would not have come in had it not been for the irrigation possibilities.

4285 B. M. HALL, Roswell, New Mexico.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I am supervising engineer for the Territory of New Mexico and the Rio Grande basin in adjacent States, in the reclamation service of the United States and the Geological Survey. I am a professional engineer. I graduated as a civil engineer at the University of Georgia in 1876. The reclamation service of the Government is under the bureau known as the Geological Survey of the In-
4286 terior Department. I have been connected with that survey since 1895. From 1895 up to my connection with the reclamation service I had charge of a large area in the southeast, with Atlanta, Georgia, as my center, in measuring all of the streams and finding out what the flow of the streams was constantly from time to time and from year to year, and had a large number of employees under me who were engaged in that way. I became connected with the reclamation service in the first part of 1904. I came to New Mexico in March, 1904, and was for several months on the board of consulting engineers, visiting different points and examining different projects, and in connection with the reclamation service in different States and Territories, practically over a large section of it, embracing California, Arizona and Montana, and in June I was stationed at El Paso to take up the Rio Grande question and consider that question and make thorough examinations and report and get up plans for the propor conservation of the waters of that river and the distribution thereof.
4287 In respect to my investigations made in New Mexico to ascertain sites for reservoirs under the reclamation act as supervising engineer, I have taken up one of those projects after another as I could get to them. The Rio Grande first and the Hondo at Roswell next, I made an examination of the Las Vegas project, and am now at Carlsbad examining conditions in order to arrive at a conclusion as to what the Government ought to do with reference to the irrigation works in that vicinity which Mr. Tracy just testified about.

Yes, the Government is now erecting a reservoir close to Roswell known as the Hondo reservoir. It has been decided that about ten thousand acres of land which is now unproductive and unprofitable can be made profitable and productive by irrigation from the
4288 waters of that reservoir when it is erected. When this land is reclaimed I should say it will be worth $100 an acre.

There is a good reservoir site near Las Vegas in Dry basin, and we estimate that ten or twelve thousand acres will be available for irrigation there. When this land is reclaimed I think it will be worth from $75 to $100 an acre.

4289 In respect to the Rio Grande project, our surveys have developed only one reservoir site that we consider adequate for the proper storage of the waters of that river. That is nine miles from Engel, above Rincon, about fifty miles north. It is called the Elephant Butte site. We estimate that that reservoir when erected will irrigate 180,000 acres of land in Texas and old Mexico. That is, that there will be a portion of that land that will be available for the settlement of the international question. It is proposed in the erection of that reservoir to irrigate 25,000 acres in old Mexico for the settlement of the claims that it has against the United
4290 States and to irrigate about 45,000 acres in Texas and about 110,000 in New Mexico. A part of that land is irrigated by direct diversion of the river now all along that basin whenever there happens to be any water in the river, but that is very precarious. They sometimes have a dry river bed for five or six months in succession right when they need the water for irrigation. The land which is now arid and unproductive in New Mexico and which can be reclaimed by the Elephant Butte reservoir would when reclaimed be of equal if not greater value than reclaimed lands in and around Roswell and Las Vegas which I have described, because there are some advantages, probably, in the climate and the longer seasons and the market at El Paso and in old Mexico.

The reclamation act could not be administered or carried out in any way if the doctrine of riparian rights should prevail in New Mexico. I have had that doctrine to contend with for twenty-five years.

4291 If the irrigated area were confined to the first and second 40's adjoining the streams on the Rio Grande or Pecos the provisions of the reclamation act could not be carried out. The reasons for that are that in the Rio Grande the only water we can count on is flood water, and it has got to be stored. The storage reservoirs have to be very large and very expensive, and if the land that could be covered by them were limited to this small area it would make them cost too much per acre in order to irrigate that land, more than the land would bring in the market or could bring, and the same conditions would prevail in a less degree on the Pecos. There is more low water flow in the Pecos than in the Rio Grande, but the same conditions, practically, would prevail. In the case of the Pecos, there is great difficulty in using the water by
4292 direct irrigation because the lands and banks are so high above the level of the river that a diversion dam is very expensive.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

As consulting engineer I have examined the Yuma irrigation system, the Laguna diversion dam, and a system of proposed canals and all the lands that could be irrigated there. The Laguna is on

the Colorado river about Yuma. There it is proposed to irrigate about 100,000 acres, and we passed up the recommendation last spring that $3,000,000 be expended there, and that is going to be carried out. The Tonto basin I also examined very thoroughly.

That is located on Salt river in Arizona, above Phœnix. I
4293 also made examinations in Montana on the Yellowstone.

That, I think, covers the main places that I have examined.

The international question that I spoke of growing out of the Rio Grande irrigation is on the Mexican side of the Rio Grande opposite the city of El Paso. (Objection by defendants.) There is an old canal known as the Acequia Madre that is said to have been in existence for about three hundred years, and that at one time irrigated a large tract of country in old Mexico estimated at twenty to twenty-five thousand acres. In 1896 there was a claim from old Mexico against this Government for the loss of that water, claiming it was due to the use above by the citizens of the United States. A protocol was entered into and the question was referred to the International Boundary Commission, which was then in existence and has been in existence for a number of years. General Anson Mills was the commissioner for the United States, and there was a Mexican commissioner. They were directed to thoroughly exam-
4294 ine the question and report upon it. They employed engineers and did report upon it and recommended that an international dam be built there at El Paso and that Mexico be given a one-half interest in it while the United States should put up all the money for the construction, and that Mexico should have one-half of the waters that should be taken from that storage dam. I have estimated what that dam would have done. It would at the most irrigate about 55,000 acres of land, and in doing so would have submerged something like twenty-five to twenty-seven thousand acres of land in the United States, and would probably have caused fifteen thousand more to be marshy, so as to destroy about forty thousand acres of land in the United States. A report of that was made by the International Boundary Commission and it was recommended that that dam be built. That report was in a printed volume and was made to the Department of State. (Objec-
4295 tion by defendants.) That report was based on the prior rights of Mexico to the waters of the Rio Grande. That was the view taken by the commission. (Objection by defendants and by intervenor.)

4296 As to the Rio Grande river being dry during the last spring I think it was in March that I first saw it or first went to it and examined it, and from that time until August the river was practically dry as high up as Rincon and at least to below El Paso. (Objection by defendants.) As to the cause of the river drying up, not having known the river before I would simply have to give an opinion of that cause as gathered from the statistics that I have seen. (Objection by defendants.) From the investigations of

others and in the official reports of Mr. W. W. Follett, the
4297 engineer for that International Boundary Commission it was stated that in the Rio Grande basin in Colorado from the year 1880 to the year 1896 there had been an increase of irrigation of 197,000 acres in the San Luis valley mainly in the State of Colorado on the headwaters of the Rio Grande and that this irrigation was not from impounded water but from direct diversion of what would be called the regular waters of the river—what ought to go to make the constant flow during the irrigation season and not the flood season—and that this was placed as the cause in those investigations of the shortage of the water down in New Mexico as well as in Texas and old Mexico. (Objection and motion by de-
4298 fendants.) I will state that I do not personally know whether the river has changed or not at all during the last number of years. From the nature of the case I could not know personally except from statistics of others that I have had the use of in my investigations and that have been considered proper statistics to
4299 use as an engineer in making plans. (Objection by defendants.) Based upon those statistics, it is my opinion that the cause is excessive diversion upon the headwaters of the river from recent canals cut directly from the river and without storage reservoirs. (Objection by defendants.) These canals are located in Colorado mainly. (Motion by defendants.) There is a great difference between taking water by direct diversion and taking water for irrigation purposes from reservoirs as to its effect upon the flow of the river below the place of irrigation. In taking water by direct diversion without impounding any water you are taking from that stream what is known as the constant flow—the flow that is available during the irrigation season (objection by defendants)—and the flow that comes generally from the melting ice and snow
4300 in the mountains, which is not a heavy flood but a large flow of the river that is available for irrigation. In taking that out and applying it directly to the crops you lose a great deal of it in evaporation and the return water from it. While there is some return water it is not anything like the amount that is taken out. A large percentage of it is evaporated and used in plant life. That portion is a permanent loss to the river at the time of the irrigation season. Now, where you store the water you catch floods that would otherwise be useless and would pass on down to the gulf of Mexico, and you hold those back and let them out as they are needed for irrigation. In that way you use water for irrigation that would otherwise be lost, and the return water from that to the river is a clear gain, whatever percentage of that comes back in seepage. In that way it adds a supply to the river which would be
4301 greatly in excess of what it would have for direct irrigation.

In regard to the projects for the reclamation of lands along inter-state streams where there is civilization and property interests below, it has been our custom to view the subject purely from an engineering standpoint and leave those questions to the proper au-

thorities of the Government to decide—those inter-state ques-
4302 tions. (Objection by defendants.)

The method of taking the water for irrigation from storage dams would injure the property below the least because it would protect the lower stretch of the river from floods as well as to add something to what would be the flow of the river without those impounding reservoirs. (Objection by defendants.) The impounding of the waters above protects the people and the interests and the property below from floods by holding back these floods in large storage reservoirs and not allowing them to run down the river too fast, and then letting them out as they are needed for irrigation. (Objection by defendants.) This system could be carried out on that plan of storage dams with less injury to the property interests below than the system of purely a direct diversion, and at the same time give an element of protection and improvement to the river below. The element of safety against floods would come at the flood season, at the time of disastrous floods on the river.
4303 The improvement in doing away with the severity of those floods would be at that time, and the diminution of the stream by irrigation above would be less in proportion for that class of water using than it would be for direct diversion. The storing of the surplus or flood waters would add an increment to that flow that it would not have under the system of direct diversion, because it would be a certain percentage of irrigation water that would be otherwise absolutely lost and it would go back into the river at the proper time for irrigation and during the growing season. I will simply state that direct diversion comes at a time when the
4304 water is needed below just as it is above, and takes it directly out of the river, while the storage system stops the water that would otherwise go to waste. (Objection by defendants.) Taking all of the water of a stream above by direct diversion would have the effect upon the flow of the river below of cutting off the entire flow of the river below except the portion that would come in from the tributaries below, if there were no such thing as return waters from the irrigation. Whatever percentage of that return
4305 water gets back into the river is added again to the river. (Objection by defendants.)

I am not acquainted with the Arkansas river through the eastern part of Colorado and the western part of Kansas.

Under the doctrine of riparian rights there could be no irrigation in New Mexico on a large scale. It is not applicable to the conditions.

If the Colorado doctrine, that because of her constitution, her laws and her sovereignty, she has the right to control and take all of the waters that fall within her borders, should prevail, it is my opinion that it would not have the effect of decreasing the area that could be covered by the reclamation service, but it would
4306 have the effect of confining it to certain States. The reclamation service in its plans for the reclamation of the lands

along the Rio Grande in New Mexico admit at the outset that Colorado has already taken all of the waters at the State line between Colorado and New Mexico from the Rio Grande and that now all the water we can get is by storing it below. (Objection by defendants.) If Colorado should take all of the waters of the Laramie river and all other rivers that flow from Colorado into Wyoming that have not already been appropriated by Colorado and there were enough land in Colorado on the headwaters of those rivers to take all the water, it would simply have the effect of making all the development in Colorado and denying it to the State
4307 below. If all the water to be utilized in the proposed developments in Wyoming had to come from Colorado, and all the waters were cut off from that river before it gets to Wyoming it would effectively stop the work below, so far as I can see, assuming that the water has to come from Colorado and that there are not enough tributaries coming in from Wyoming to make it up. (Objection by defendants.) The same condition would arise as to other States lying below Colorado, so far as I see.
4308 This Colorado doctrine would interfere with the carrying out of the reclamation of the lands in any of the States lying below Colorado along the streams that rise in Colorado or in any other State that lies above the one where the reclamation projects are in contemplation. It would not necessarily decrease the acreage that could be irrigated in the arid west but would limit it largely to one locality, and that would be the upper locality, if there was enough land to use all of the water. (Objection by defendants.) I would state, however, that in our reclamation work we do not recognize an excessive diversion of water, a diversion that is greater than is necessary to properly irrigate the body of land
4309 to which it is carried. In such cases we have gone at the subject purely from an engineering standpoint and have taken all of the conditions into consideration and have not taken unto ourselves the right or privilege of deciding those questions. We have felt that the whole matter ought to be submitted to proper authorities and settlement made before we could act on it. The Rio Grande is a case in point that I have had direct charge of myself, and that is the principle upon which I have proceeded. I have not gone into the question of States' rights, or even Government rights, but I have shown what could be done in an engineering way and submitted it to the Secretary of the Interior, who is cooperating with the other departments of the Government for a proper solution of the question. We have proceeded from an engineering standpoint, and from that standpoint we would have nothing to do with the rights of those people down below.
4310 (Objection by defendants.) From an engineering standpoint we have only to consider how much land will be reclaimed without regard to where that land is, and where that water would do the most good. That is the question that comes before us—

where that amount of water will accomplish the most good, without regard to State lines and without regard to the different interests in any way. (Objection by defendants.) I have
4311 already stated that it would have the physical effect, if the water is all diverted in the State above, of making the stream entirely dry during the ordinary seasons in the State below. Now, the question we meet as engineers would be which weighed the heaviest, which was of the most importance,—for that stream to keep its continuous flow of water or for the water to be used for irrigation to the best advantage of the people on the best land,—and cases might be so different that we might decide it ought to be done in one State or in another or we might pay no attention whatever to State lines from an engineering
4312 standpoint. We would pay no attention to State lines. For instance, we are planning work in New Mexico which would interfere, we might say, with the irrigation in Texas and old Mexico. We have not looked at that from the standpoint of the rights involved at all, but we have simply recognized that these questions do exist and we have had to plan in such a way that in the settlement of them they may have the water with which to settle them, and we do not conflict with investigations that might be made by the proper departments of the Government for that purpose.

Cross-examination on behalf of defendants.

By Mr. DAWSON:

4313 I first located in and became a resident of the arid region during March, 1904. I have kept very close up with everything that has been done and written on the subject so far as it has been practicable ever since the Geological Survey of the United States has been considering this question, even a long time before the reclamation act was passed, and my practice as civil engineer has been largely in connection with mining canals and dams and things of that kind, but my personal and practical knowledge of irrigation works and the peculiarities of the streams in the arid region has been acquired since March, 1904, but as a continuation of studies I had previously made on the subject by being not only in contact with the publications but with the men who were doing the work.

I first saw the Rio Grande in March, 1904. I simply crossed
4314 it. I crossed it just about El Paso, and it was practically dry. In April I was at Las Cruces and at Rincon and up the river that way. My understanding was that that condition had begun in February—the low water. I have never been on the Rio Grande in Colorado in the San Luis valley, and I only know in regard
4315 to the irrigated lands there from the statistics that I have referred to. I would suppose from that information that there

is very little irrigating done there as early as March or April. I would not attribute the low water in the Rio Grande in March to the irrigation in the San Luis valley—my understanding was that that was an exceptional case—because at that time of the year there was generally considerable water in the river, but last year it was peculiarly dry at that time owing, they said, to the fact that there was no snow in the mountains.

4316 The impression I have gotten from the statistics and from reading is to the effect that the land has been very largely denuded of its timber on the Rio Grande and its tributaries within the last ten or fifteen years. The effect of cutting and burning off the timber at the headwaters of the stream and its tributaries is to increase the floods and to decrease the low water flow—the constant flow of the stream. I know that from long experience not only here — from in the East.

The system of irrigation from waters stored in reservoirs is less damaging to the lower reaches of a stream than where irrigation is practiced. I will qualify that to this extent—that is, considering that the land below has no storage reservoirs of its own. The evapora-

4317 tion would be the same for any water that is spread over the land at a certain time. I simply wish to convey this idea—that any system of irrigation that is not excessive, that is properly adequate to the land it goes on in this arid region, exposes a very large surface of the ground to evaporation, and that it evaporates very rapidly and a great deal of it is taken up in plant life and only a very small percentage of it gets back to the river; but in case of the impounding of water you are using water which would have been lost, and if you are getting back any percentage of that you are getting back something you would not otherwise have had.

Q. Speaking about a certain percentage of the return waters, do you know whether those who have made investigations of that subject say that such return waters average from thirty to as high as sixty-five per cent.?

A. Yes, I recognize the engineering fact, though, that all depends upon the conditions, every bit of it. You might imagine a case where there would be no return waters, if just the proper amount were used for irrigation. It is generally the excessive irrigation that makes these large returns.

4318 As a practical question, you might conceive of an ideal condition in which all of the water might be used for plant life, but practically you cannot attain to that, simply because we have no means of applying the water in that way, and whatever that excess is that does not evaporate and does not go into plant life goes back to the river. Of course when you store water in a reservoir and afterwards spread it over the land you have evaporation both from the reservoir and from the water after it is spread over the land. But the advantage you get from the storage is the fact that you are impounding water which otherwise would run to waste, at a time of the year when it is not needed for irrigation, and the

return water itself is a part of the water that would have
4319 gotten away. It is true that the irrigation of land itself in a certain sense is a system of water storage, provided you take flood waters only. It of course would hold it back. If you are taking it out to irrigate with it is holding it back just at the time it is needed below. It has retarded a part of the ordinary flow of the river, but it has not retarded the flood waters of the river, unless your diversion system is large enough to make a flood system for carrying out the floods all over the lands; then you do get a reservoir of that kind. There are times on the Rio Grande when there is more water coming down the river for a considerable period than is used by anybody either in Colorado or New
4320 Mexico for irrigation, and any of the water diverted at such a time, at the time of a flood in the river, would have that effect,—to store that water and replenish the flow during the low season, and that whether by direct diversion or by a storage
4321 system. It might be and probably is true that irrigation would be of advantage to the lower region of the Rio Grande
4322 in New Mexico when the water was not needed in Colorado, and *vice versa*. If the San Luis valley is some one hundred miles in length and sixty miles wide and surrounded by high mountain ranges and has but one outlet, that through which the Rio Grande proceeds into New Mexico, and the valley is level and smooth, pitching in all directions towards this outlet, and if it be true that the water level of the valley is only from five to twenty feet under the surface of the soil, and beneath that water there is a rock or clay bed, it would furnish what we might call ideal conditions for the best results from return waters, if this clay bed has a dip toward the river and does not lead off toward some sub-
4323 terranean system. And assuming that it has, and that the only outlet is by the Rio Grande, and it has a gravelly soil above it, I should think that would be an ideal condition for storing any waters that would percolate into the ground and give it a chance to get out.

The statistics I refer to give this extra irrigation in the San Luis valley of 197,000 acres in sixteen years as the cause of that
4324 decrease. The statistics referred to give an increase of 3,000 acres in the sixteen years, in irrigated lands, mainly in the
4325 upper part of New Mexico, as I understand it. The sixteen years I refer to were from 1880 to 1896. That is the time those statistics were gotten up. If the facts were clearly established that it should appear that the timber had been practically destroyed on the headwaters of this river and its tributaries, and if it be proved that for the last ten years the snow fall has been less, and allowance has been made for these two things, and after that deduction is made there is as much water crossing at the Colorado-New Mexico line as formerly, then some other cause would have to be looked to as pro-
4326 ducing the less flow of water in the lower reaches of the river in New Mexico. It is admitted to be true, if other conditions are equal, as to markets and the season and all of that, that

water can be used to best advantage near the head of a stream if the land and climate are equal to that farther down, and that has been taken as a basis for work frequently, because you save percolation and evaporation between the two points.

Cross-examination on behalf of defendants continued.

By Mr. HAYT:

4327 The impounding of water and the irrigation of land as practiced in this vicinity (Roswell, New Mexico) along the Pecos river, so far as I have been able to find out by observation and otherwise, has caused a good flow of water in the river while this irrigation is going on. Now, what the flow was or would have been before I am not able to tell. I do not think there are any statistics to show what it was. I do not think the impounding of water from the Pecos river in this vicinity and the use of that water in the counties of Eddy and Chaves has injuriously affected the Rio Grande for the purposes of irrigation below the mouth of the

4328 Pecos. I think there is a limit to which that work can go, and provided you have plenty of land and a limited supply of water there will come a time when you will cut off the water below to a considerable extent. The irrigation that has been practiced has not reached that time so as to make any material difference in the river below.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4329 As to the irrigated lands along the Rio Grande in the Territory of New Mexico, I have seen a great many tracts of land that are levelled off and have ditches on them and show that they have been cultivated. I have noticed up and down the valley a great deal of land that way that is not now cultivated and is absolutely arid.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

The conditions in the other States that I have been in since I have been with the reclamation service making investigations are similar to the conditions prevailing in New Mexico.

4331 J. J. HAGERMAN, Roswell, New Mexico.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I live at Roswell, and have lived here about three years. Before coming here I lived at Colorado Springs, Colorado. Previous to that I lived in Milwaukee, Wisconsin. I am a graduate of Ann

Arbor, in the class of 1861. I first became acquainted with the Pecos valley in New Mexico in June, 1889. I went by wagon from the Texas Pacific road, from Pecos, Texas. I became con-
4332 nected with the irrigation company in the Pecos valley that had lately been formed there to develop the valley. That was in 1889. I never saw any land cultivated in Eddy county previous to that. In respect to improvements made by that irrigation company, there is what is known as the Southern canal that started about six miles north of the town of Eddy, now Carlsbad, and ran south about thirty-five miles. It is a large canal and cost a large sum. In connection with that was a reservoir known as Lake Avalon, which cost probably $200,000. The dam alone cost $150,000.

A few years after that the East Side canal was built, and the McMillan reservoir, a very large reservoir that cost probably $250,000, and there was no end of laterals, small and large, and all the other necessary appliances for a great irrigation plant, and
4333 by the time they were completed they cost $1,500,000, in Eddy county. The lands in Eddy county were reclaimed from their arid condition by the waters that were stored and impounded in the reservoirs mentioned and by no other means. My recollection is that at one time there was 20,000 acres under cultivation. More acres had water applied to them with the intention of cultivating. My belief is that that plant, put in perfect condition or reasonably good condition, would irrigate between forty and fifty thousand acres. I became president of the Pecos Irrigation & Improvement Company that was doing all this work, I think in 1890. The Pecos Irrigation Company, of which Franklin G. Tracy, a witness in this case, is the president, is the successor of the company I have named and of which I was president. That company operated in Chaves county also, where I reside. In that county it built
4334 what is known as the Northern canal, which begins near Roswell and runs south about thirty miles. The canals, dams and other improvements probably cost $250,000, as near as I can remember, and the water supply is sufficient to irrigate about 10,000 acres. The Feliz Irrigation Company owns that canal now.

I was also connected with the Roswell Land & Water Company, another irrigation company operating in Chaves county. I was president of it for about nine years. I think that company irrigated about fifteen thousand acres. The waters that were stored by the Pecos Irrigation & Improvement Company were taken from the Pecos river and its tributaries. The water that supplied the North-
ern canal was taken from the Hondo and its tributaries. The
4335 water that supplied the Roswell Land & Water Company was taken from the North Spring and South Spring and the Berrendo springs in the vicinity of Roswell. These streams run into a stream which is a tributary of the Hondo, and that is a tributary of the Pecos.

Since my connection with these different companies I have given

a great deal of attention and study to the irrigation possibilities of the Pecos valley. My impression is that it would be safe to say that forty-five to fifty thousand acres can be added to the irrigated area in addition to the land now irrigated in Chaves and Eddy counties by the use of the unused waters of the Pecos river and its tributaries and by the intelligent application of those waters and by impounding the flood waters in the basin of the Pecos river. I be-
4336 lieve if the irrigation possibilities of this valley were developed to a reasonable limit it would bring at least 100,000 more people to this valley and the country and towns and the farming and fruit raising and all the collateral industries that this would bring about.

In regard to the worth of the land now reclaimed before it was reclaimed, most of the pasture lands along each side of the Pecos river were long ago worn out and the grass eaten up and gone so that even for pasture it was of very little value. The fact that hardly any of it was bought from the Government at $1.25 an acre is proof that it was not even worth that. The lands which can be reclaimed by the waters of this valley are worth almost nothing in their present condition.

4337 I have given some thought and study to the doctrine of riparian rights, and it would have been impossible to have made the development which has been made in Chaves and Eddy counties under the application of that doctrine. If this doctrine were invoked it would stop future development in this valley. As a matter of fact it would be a physical impossibility in most places in this valley to irrigate any land at all if you were confined to the first 40 of a section or the second 40 of a section back from the river. I know of no places along the river where you could do any
4338 irrigating. If you were confined to a little strip of land it would make irrigation impossible because no one could afford to put the dams in the river that would be necessary to raise the water high enough to get it onto lands in such small area.

There was no railroad in this valley when I came here. In the year 1899 I raised the money in the East to build the road from Pecos City to Carlsbad, and that was finished in 1890; that was ninety miles. In 1893 I raised the money to build the road from Carlsbad to Roswell, seventy-five miles; and in 1897 I raised the money in the East to build the road from Roswell to Amarillo, Texas, a distance of 220 miles, I believe. All told a distance of 375 miles. It is a broad-gauge road. I was president of the companies that built these roads. The inducements which led me to build the road from the Texas Pacific, from Pecos north, was that I believed that the development of this valley by means of irrigation would in time make the railroad pay. That was the only inducement, the development of the country. The railroad would never have been
4339 built had it not been for the irrigation possibilities of the Pecos valley.

I believe that eighty per cent. of the property which now exists in

Chaves county so exists by reason of the taking of the water from the streams and applying it to the lands for irrigation purposes.

I have made some study of and know something about the reclamation act passed by Congress June 17, 1902. I think that whatever improvements we have in the future through a larger and more economical use of the water for irrigation depends entirely on that act. If the doctrine of riparian rights were applied to its logical result it seems to me there would be no excuse for the existence of the reclamation service. If we were obliged to confine the irrigated area say to the lands bordering on the stream and within half a mile
4340 of it, its effect would be utterly destructive of the administration of the reclamation act, because there could hardly be any irrigation of that kind. It is not practicable from a physical standpoint.

The Pecos river is an inter-state stream, rising in New Mexico and flowing into Texas.

I have made a study with regard to the effect of irrigation upon forestry. It is impossible to develop forestry in the arid region without irrigation except in a few scattering small places. The effect of forestry upon atmospheric and climatic conditions in the arid region is very beneficial. In explanation I will say that one of the greatest drawbacks to the arid region is the high winds now in certain seasons of the year which cause dust storms and make the country almost unfit to live in; but the more trees there are planted and the more ground there is covered with vegetation, of course the greater the rainfall, and that which does fall
4341 is conserved and moistens the atmosphere and moistens the air, and serves as a barrier to the winds and makes a country which otherwise would be almost uninhabitable just as good as any other country.

When I first came into the Pecos valley I don't remember that I saw a tree in it, as far as I saw it. Thousands of trees have grown up since. In the town of Eddy the trees, where they are concentrated, are a very great protection from the winds and the dust, just as they are around here. I never saw this country until 1894 around Roswell. I have never noticed very much difference here because the trees were here when I first came here in 1894. I have seen the effect of the cutting of the forests on the mountains that
4342 supply these mountain streams with water. Of course in all mountain countries there are long periods of drouth and times when the rains are extremely severe, and where the forests have been cut off and these great rains come and wash the soil away very quickly. The water comes down into the valley quickly because there is nothing to hold it back, and it makes devastating floods, but where the forest is preserved not only the trees but the undergrowth acts as a sponge to absorb and hold the water, and this water which otherwise would have gone down in a flood is, a large share of it, held back and given out in dry times to keep these streams running all the time where otherwise in the dry times they

would be entirely dry. That has been very noticeable in some places in Colorado where the trees have been cut off the mountains; and I have been in southern Europe a good deal, in Italy, France, Greece and Turkey, and have seen the effects there of the cutting off of the forests and the immense expense which the governments there are going to to restore them. The whole Black forest region of Germany, which now is one of the most beautiful spots in the world, covered with fine pine timber, there was a time when it was all bare, and it has taken a century or more to restore it.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4343 I do not know what the records show that have been kept in regard to the amount of snow fall in the mountains for the last few years, but I have read a good deal about it. I believe they claim that the rainfall in this part of the Territory is about 4344 twelve to fourteen inches annually. I am not as well informed on that as some other people. There is often snow falling in the mountains west of here when there is no snow falling here in the valley, and that condition practically prevails as to rainfall.

As to the effect upon the valley here if people above us should take all of the water of the river for irrigation, I will say that 4345 if people farther up the river or rivers took all the water before it got to us of course we could not irrigate at all. If the people at the head of a stream that was subject to severe freshets at certain seasons and severe drouths at other seasons, the same as all streams in the arid region,—if the people high up on those streams should store the flood waters and hold them back and use them in the dry season a very large share of that water would get back to the bed of the stream and the people far- 4346 ther down could do a good deal of irrigating. If by proper storage reservoirs the water were held back in Colorado, stored up in the mountains, then it could be used in Colorado and a very large share of it would go down to Kansas so that irrigating could be done there on a considerable scale. You cannot store water in a flat country; it has to be stored in the foot-hills and places where nature has made reservoir sites that could be improved. If that water were allowed to run to waste it would go right away over Colorado and down past Kansas and no one would use it. Let me cite an instance: When we were building the big McMillan reservoir in the lower Pecos valley some people who owned an irrigation enterprise at Barstow, Texas, informed us that they would not 4347 allow us to store water in the reservoir because the water belonged to them, that they had the right to it and that they were an older concern than we were. We told them that the biggest floods in the Pecos valley came in the fall when they could not use the water anyway and it was running to waste and they were short

of water in the dry season, and that if we stored water in very large quantities in these big reservoirs and used it in the dry season when there were no rains a large share of it would go back to the river and there would be a good deal more water in the Pecos river at the time of year when they needed it the most than if the reservoirs were never built. Now, that proved to be a fact. I know that to be a fact. The president of that company, Mr. Barstow, I know him very well, has told me often that our reservoir system there was a God-send to them because they got water in the dry season when they needed it.

There is another method of taking the water for irrigation, which is by direct appropriation from the river without any reservoir. If the method employed in the Arkansas valley in the 250 miles west of the Colorado-Kansas State line was the direct withdrawal of water from the river without any reservoirs then it would not tend
4348 to increase the flow of the river below. If the reservoir system is adopted the waters will be saved not only for the use of the country near which the reservoirs are situated but for the country away below; but if the water is taken by direct appropriation, over and over again, experience has proved that the effect is to reduce the flow of the river below the last ditch. It is not necessary to have the intake of the ditch or canal that is to be supplied right near the reservoir that supplies it, and it is often located a number of miles below the reservoir that furnishes the supply of water. This is one practicable way of doing it. The nearer
4349 you can use the water to the place of impounding the more economical it is.

Cross-examination on behalf of defendants.

By Mr. HAYT:

It is more economical to use the water for irrigation in the vicinity of Roswell than it would be a long distance below; and that depends upon circumstances a good deal. A good many reservoirs are made right in the bed of the stream. There is very often a gorge where a dam could be put in and the reservoir would cover part of the stream and then you would take it out and let the water run down the stream and make its way down. In that way there is not much loss, because I don't think there is much seepage from the bed of an old river. I don't think there is much loss in that. But where that is not practicable and you have to make a long ditch along the side of the river and carry the water in that way a long distance before you use it, that is generally wasteful,
4350 and how wasteful that may be depends on the character of the water. For instance, in this Northern canal we carry the water about fifteen miles before we use it. When we first built the canal that was very wasteful because the canal went through a porous soil, but the Hondo water is very muddy, and a very sticky kind of mud, and in time that cemented the canal so that it is now

perfectly tight. You see there are such innumerable natural conditions in all this irrigation business that it is not easy to lay down a general rule in some things. Now, the waste water in the Southern canal down below in the lower valley is great because the water there is always clear. The mud of the Pecos river settles in these reservoirs. When it gets into the canal it is clear, so that the canal don't cement and it don't fill up these leaks as it does here. As a general rule, the farther you take the water from the canal before applying it to irrigation the greater the waste and the greater the cost of maintenance. If that water had to be conducted into ditches or canals for a distance of a hundred miles the leakage and evaporation and cost of maintenance would in many cases take
4351 away all the profit of the enterprise and render it impracticable.

I have spoken of conducting this water in the bed of the stream, and have stated that in some instances that would be less wasteful than if conducted in canals. But I guess generally it would be pretty wasteful. You take the Hondo, they will practice that, but they will take it a short distance in the bed of the stream, and then there will be no waste, apparently, to speak of; but that is a peculiar case because this muddy water makes the bottom of the stream tight. In many a mountain stream that I think of in Colorado if that were done I think it would be very wasteful. Generally, I should say most decidedly it is a great deal better and more economical to use the water as near as possible to where it originates. After you leave the mountains many of these stream beds become dry and sandy and very absorptive of the waters of the river.

I am familiar with the Arkansas river in the State of Colorado and western Kansas, and that is a river which for a long distance in eastern Colorado and western Kansas has a bed of dry, absorptive sand that will soak up and waste a great deal of water. If the water originating in Colorado were allowed to run down that stream
4352 until it got to Kansas before it were used, a great deal of it would be wasted, not only from evaporation, which cuts some figure, but from the fact that this porous bottom of the river would absorb and waste it. There is no doubt about that. The storage of water as I have described it in Eddy and Chaves counties and the use of that water for irrigation as here used has been of further benefit to the people below in the way of lessening the dangers from the floods and freshets. Of course the bigger the reservoir the more of a flood it will keep back and the less will go down to do damage. That is just common sense and common experience. The greatest benefit from the enterprises in this vicinity has been in holding back the water to use in the dry seasons. I would hardly say they have been of great benefit in the way of lessening the floods. The reservoirs in this valley really cut but small figure in storing the water of the biggest floods. A flood continuing, for instance, a week, as

they often do, will fill all the reservoirs in twenty-four hours,
4353 some of them, once in a while one of them such as we had last fall; but it is the water that is held back that does the good. If the storage of water here is extended, other reservoirs built, and the purposes of the reclamation act carried out along the Pecos river, that will have a beneficial effect upon the river below in times of high water.

The streams I have mentioned from which water is taken for storage and irrigation in Chaves and Eddy counties have their sources in the Territory of New Mexico. I think the return seepage and drainage would not equal the total water taken out to a large extent along the Arkansas river in Colorado and used for direct irrigation. I don't say that it would tend to equalize the flow below during the dry season much. During the dry season whatever water there is is a continuous flow of water. If you
4354 take part of that out and say forty per cent. of it goes back as seepage there would be sixty per cent. that would go somewhere else. It would not go down the river again. Of course the evaporation from irrigation is very large. It is a great deal larger than it is—you take a certain quantity of water out of the river and spread it over the lands the surface is so much larger that the loss from evaporation is large, a great deal larger than it would be from the same water if you let it run down the river and didn't take it out at all. If this water was taken out during high water and spread upon the lands adjacent to the Arkansas river for a distance of ten or fifteen miles back from the river, that would result in a large amount of seepage water returning to the river. If you took it out in time of high water and took it back from the banks of the stream a considerable distance, of course a great deal of that water would be left in the land after the flood had ceased and would grad-
4355 ually find its way back to the river in the dry time. To that extent it would be a help to the stream below, and to that extent it would act similarly to a reservoir and would act to that extent very much as the forests on the mountains act, as a sponge to hold back the rainfall and let it come down gradually in dry times. Of course how much that would help would depend very largely on how far you took it back from the river. If you used it right on the edge of the river or very near the edge of the river it would soon drain out; but if you took it back a considerable distance—the farther back you took it the longer it would take it to get back to the river. The better regulated it would be in proportion to the distance you took it back. Now, you take it ten or fifteen miles below Carlsbad, there are numerous springs along the edge of the Pecos river now that did not exist when those irrigation works were established, and all that comes from the drainage or seepage water that is used for irrigation. That is notorious. Everybody knows that that lives down there. Whether those springs are constant or perennial depends upon the continuity of the irrigation. After a while if you stopped irrigation the springs would stop flowing. The result up

to the present time with such irrigation as we have had has made the lower river a great deal better river for irrigation
4356 than it was before. Generally speaking, I think we get of forage crops, in this vicinity (Chaves county) certainly two and a half or three times as much per acre per annum as they get in Michigan or Wisconsin. I know of good farmers in the Hagerman district especially who make a good living and prosper, with a family of five, on forty acres of land.
4357 I know a man who received $3,000 for the apple crop off twelve acres two years ago. I know another man who two years ago got $2,000 and this year I understand he got $2,500 for the apples off about fifteen acres. How much money a good farmer can get off an acre depends very largely on what he raises. Some celery growers here make a good living off two or three acres, but generally speaking, with pretty good farming not the very best, I think a family of five could make a good living off forty acres in this valley. It is the tendency of development by irrigation to reduce the holdings to a small acreage of land. It is necessarily so. A man cannot afford to own water rights and pay water rent on a large acreage unless he makes good use of it. I think that with intensive farming in a small tract much less than forty acres is sufficient to support a family of five in this locality. I do think that, because that has been proven, for instance, in Utah, among the Mormons, especially those who are good workers. But it takes time for that. As time goes on the tendency in irrigated districts is to make small farms and a dense population. It is hard to say to
4358 what extent we depend upon the melting of the snows. We do, considerably. Not as much as in Colorado, which is farther north, and higher mountains. Our snow melts off quicker than it does there; but still it is a very great help not only because the melting snows make the streams run water in the early part of the year, which is usually the driest, but a great deal of the moisture goes into the ground where the forests are and we get it
4359 gradually during the season from seepage.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

The same natural conditions that prevail in New Mexico also prevail in what is known as the arid region of the United States generally, over which I have been considerably, and which extends from the 98th or 99th meridian almost to the Pacific coast
4360 west.

I am president of the company that owns a large apple orchard in the Pecos valley of about 500 acres, and there are 50,000 trees. It has been developed by irrigation processes entirely. This country is peculiarly adapted to the raising of apple trees. They grow here better than in any place I ever saw. It would be impossible to develop apple orchards here without the aid of irrigation.

WASHINGTON, D. C., February 25–March 9, 1905.

4362 B. S. RODEY, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I am the present Delegate from the Territory of New Mexico to the 58th Congress. I was also a Delegate in the 57th Con-
4363 gress. I have lived in New Mexico for twenty-four years. I was city attorney of my home town of Albuquerque, a member of the territorial council in 1889, and a member of the constitutional convention of 1889–1890 in New Mexico, which convention was called voluntarily by the citizens of the Territory without the aid of any enabling act of Congress, under a local act of our own legislature.

In a general sense, I have been over the Territory extensively since I have been here, and am very well acquainted with its physical conditions. Only in portions of the Territory at an elevation of 7,000 feet and upwards can crops be grown by depending on rainfall, and in those places only short crops, those that ripen between June and the latter part of September. The area where such crops can be raised is small as compared with the bottom lands in
4364 the lower countries—about four or five per cent of the irrigated portions. The area along the Rio Grande and Pecos rivers and the other streams where crops are actually raised by irrigation is about half a million acres, in my opinion. The Geological Survey gives it at considerably less than that, but I think the Survey is wrong. I have repeatedly stated in speeches on the floor of the House and before the committees of Congress that in my opinion when all the flood waters of the catchment areas of New Mexico are impounded somewhere between ten and fifteen millions of acres can be irrigated. I know that many people disagree with this
4365 view, but I have arrived at that conclusion deliberately. I should say that one-half of this area is now Government land. This land in its present condition has no value except
4366 as pasture land. It would be worth about fifty cents an acre. When irrigated, this land in the main river bottoms near the large towns would be worth anywhere from fifty to three hundred dollars an acre. If the utmost limit of possible irrigation were realized it would support two or three millions of people in the Territory, but I anticipate it will be many years before that will be done.

If the people of the Territory are compelled to permit the waters of the streams to run undiminished and unaffected it would stagnate the Territory. If the old common law doctrine of riparian rights, that water must go by undiminished and undeteriorated in quality, should prevail in New Mexico and the semi arid Southwest, it would render the streams useless and the land along them abso-

lutely useless. You cannot irrigate at all from any stream without loss to the stream in quantity of water, because you lose what forms the water table in the ground, what goes into plant life and what evaporates, which, in the first years of its use, is considerable, growing less as the use continues and the water table in the ground
4367 becomes permanent. If the irrigated area were confined to lands lying near or adjacent to the stream, say the first or second 40, it would render future development small. It would consist only of little ribbons of land along the streams. It would stagnate it, practically. And if they were confined to the lands immediately adjacent to the stream it would thwart the main purpose of the reclamation act of Congress of June 17, 1902.

I have made considerable study of this question of irrigation, and my views to some extent are expressed in the reclamation act. In regard to what that act would accomplish if it was administered in accordance with the spirit in which it was enacted, I will say
4368 that it will accomplish the full reclamation of the West. It will turn to beneficial use all the waters that fall in the entire catchment areas of the West, or as nearly so as can be; and the possibilities of reclamation under that act in my opinion are
4369 not even appreciated by the reclamation service at this time.

I was at Solomonville, Arizona, a few years ago, near the Gila river, and I witnessed the fact that the water of the river was taken out and entirely used in the irrigation of some wheat fields on both sides. Thereafter I was driving down the stream and I saw that the water reappeared in apparently almost undiminished quantity five or six miles below.

I am familiar with the general history of New Mexico. The waters of New Mexico have been used for irrigation from time
4370 immemorial. First the waters were used by the ancestors of the present Pueblo Indians when those Indians were immensely more numerous than they are at the present day. The remains of their acequias and ditch systems are apparent even unto this day. Even when the Spaniards first went in the territory in 1539 the Pueblo Indians were irrigating in the Rio Grande valley. There was no settlement at that date farther south than the present San Marcial or old Fort Craig. Later there was a settlement down at El Paso. Different pueblos used the water for irrigating at different points up the Rio Grande valley from San Marcial up as high as Taos during the two centuries following; but several of these pueblos have gone to ruins or changed their locations or died out before the United States took possession of the county in
4371 1846. Practically the whole Rio Grande valley from the places where the river debouches from the deep cañon it occupies from the Colorado line straight southward into New Mexico for about sixty or seventy miles to Embudo has been irrigated from thence southward to almost the Texas line at some time. Of course I except from that long stretch of valley *at* places where the river,

as at Elephant Butte, is in the cañon and cannot be taken
4372 out on the river bottoms near by. I have seen water enough in the Rio Grande at my town of Albuquerque to float a man-of-war were it deep enough, but of course it is not more than three or four feet deep and is spread over a good deal of country. I have seen that continue for a month at a time when it was not necessary and could not be used for irrigating the crops. It went down toward the sea unused. I said "toward the sea" because I don't think that any water that ever flows in Colorado or northern New Mexico gets to the sea, at least not on the surface. It
4373 all evaporates or sinks into the sand before it reaches the mouth of the Conchas river in Texas. Later on in the summer months the Rio Grande grows less and less in the quantity of the water that flows in it, and that is used for irrigation, and at times gets very scarce. I have seen the river absolutely dry from ten miles north of Albuquerque to El Paso for several months at a time.

4374 The aim of the reclamation act was to impound the flood waters and incidentally the perennial flow as well, whenever that was possible by arrangement with those who might have prior appropriations. As to what was to be done with the perennial flow when parties had a prior right, that question was argued in
4376 the committee at great length. If you impound the waters of a stream to the detriment of a prior irrigator below, it is my legal opinion that that must be done only by condemnation proceedings, (objection by defendants); but there are other questions that come in, and that is,—I have considered it somewhat,—if the impounding of that river occurred in another jurisdiction there is a grave question as to whether or not he would have any remedy. If it occurred in a different State, for instance, or Territory. If it occurred in the same jurisdiction it would be a vested right. There is no question about it. You cannot take it away. If the water were taken away in another State, I have very
4377 decided views on that.

4378 The impounding and use of the headwaters of the Rio Grande in Colorado has undoubtedly lessened the quantity of the perennial flow in New Mexico and to that extent injure the actual irrigation and possibilities of irrigation in that Territory. I cannot say to what extent off-hand, but I know the yearly flow in the upper Rio Grande where I live is much less than it was twenty-four years ago and is universally conceded to be caused by the taking out of the waters in Colorado principally. Very little in New Mexico above that. (Objection by defendants.)

4379 Now, going back to your former question, it is a difficult question as to the right of an up-stream State to take all of the water. As to the effect on a down-stream State of taking the water in the up-stream State, I will say that if the irrigation project that would result in that is built so far above the State line as that all

the water impounded is used before it reaches the upper line
4382 of the down-stream State it might affect the conditions below.
It was not the purpose in passing the reclamation act to give the up-stream State the right and power to take all the flood and perennial waters of an inter-State stream regardless of the fact that the lower stream State has been in existence and its property has been created before the settlement of the up-stream State. That certainly was not the result intended to be obtained by the passage of the act.

4384 As to the extent to which the Rio Grande river has been lowered or dried up by the use of water for irrigation purposes in the State of Colorado, I cannot answer definitely. (Objection by defendants.) I know it has diminished the quantity some, but how much I couldn't say. I have examined the measurements in the Geological Survey of the United States Government of the Rio Grande at Embudo, Rio Grande, San Marcial and El Paso, but in my opinion they do not go back far enough to enable me or anyone else to estimate the loss by the use of water in Colorado, because we cannot tell what the flow of the river was prior to the making of those measurements, but it was more than it was at their beginning, I am sure. (Objection by defendants.) But I want to add this there in explanation of the answer I have given, that it is
4385 contended by people living in the Rio Grande valley and by the Geological Survey that a continuous drouth of more than ten years last past, probably fifteen, with slight intermissions, has existed in the upper Rio Grande catchment area in both Colorado and New Mexico.

I have here the record of the mean annual flow of the Rio
4386 Grande for the years indicated and at the places named, which is as follows, in second-feet:

4387	At Embudo	1889	1,032
		1890	1,467
		1891	1,855
		1892	1,240
		1893	841
		1895	1,222
		1901	787
		1902	390
		1903	1,437
	At Rio Grande	1897	2,610
		1898	1,501
		1899	943
		1900	977
		1901	1,179
		1902	587
		1903	2,306

4388	At San Marcial.....	1897.....	3,045
	.....	1898.....	1,335
	.....	1899.....	332
	.....	1901.....	901
	.....	1902.....	278
	.....	1903.....	1,762
	At El Paso.....	1890.....	1,327
	.....	1891.....	2,653
	.....	1892.....	1,285
	.....	1897.....	1,871
	.....	1898.....	922
	.....	1900.....	236
	.....	1901.....	499
	.....	1902.....	70
	.....	1903.....	1,429

Cross-examination on behalf of defendants.

By Mr. DAWSON:

4389 It is true that the construction of reservoirs in an up-stream State and the using of water for irrigation in that State at times when there is an excess of water will augment the flow of the stream in the down-stream State at a time when the water would be low; and I go further than that, though, and contend that it augments the flow in the down-stream State at all times when the water table is made in the upper State. I am firmly of the opinion that the construction of any impounding reservoir in an up-stream State ultimately helps the flow of the water in
4390 the down stream State. I am of the opinion that the reservoirs should be commenced near the heads of the streams in their order, because water impounded down stream is forever lost to the upper country. There is not much difference in the two modes of impounding water—either by reservoirs or by irritating the lands by flood waters. If you use it on land it keeps soaking away and makes a continuous stream below more steadily. If you let it loose from a reservoir above it flows down at once with very little loss to the place where it is to be used, but flows suddenly and ends quicker. In my opinion the flow of inter-state streams may be equalized by the impounding of water in reservoirs and by the use of the
4391 water on lands near the head of the stream in the way of irrigation. In that way the maximum flow of the lower stream can be diminished and the minimum flow increased; and not only that, but that is the natural result of it. The building of the down-stream reservoirs after the reservoirs are once constructed on the tributaries and headwaters of the stream puts to beneficial use more of the water, or to additional beneficial use, because some of that same water would have been used before. I might say here that the same water on a long semi-arid country stream might be used

for irrigation up near the head of the stream and then again farther down, and afterwards still farther down, until, if it had no additions, the quantity would be diminished to almost nothing by using
4392 it over and over again. I know as a matter of fact from personal experience and observation that water can be used over and over again in this valley. The instance I cite from Solomonville, Arizona, can be seen by anybody, where the whole stream is actually taken out and put on the land and the stream recurs five or six miles below. And that is true all over the arid west where waters are used for irrigation along the streams from which the water is taken for irrigation.

I have made personal investigations for the purpose of determining the underflow of streams and how much it amounts to, and can give an instance on the Rio Grande. The Rio Grande
4393 from the time it leaves Santa Domingo, which is some forty miles below Embudo, to a point at which the bed rock is the bottom of the stream and the entire stream is necessarily on the surface or apparently so, diminishes vastly in quantity in the next ten or twelve miles, when it strikes the alluvial bottom of the Rio Grande, and at Corrales, thirty miles farther down, there is not anywhere near as much water. But from this rock bottom point at Santa Domingo south to El Paso and perhaps farther—because I have not had knowledge of the stream below that—there is a series of underground lakes from Santa Domingo down to below Albuquerque, and the first lake occurs in the river bottom proper, which bottom is from three to eight miles wide for all that distance. The lake begins at about ten feet or less beneath the surface and extends about forty-five feet; then occurs an impervious stratum, and there is no water until you reach seventy feet in depth again, and from seventy to ninety-five feet there is another stratum of water, and then varying small strata of water a foot thick and less down to seven hundred feet, which is the deepest examination made. When you put a pipe through the upper stratum within eight or ten feet of the surface, from the bottom of that stratum at forty-five feet down to the seventy foot lake the lower lake flows into wells
4394 in the upper lake, and it don't make any difference how big a pipe you put in—you can put in an inch pipe or one as big as a barrel and the water from the lower lake flows into the upper one, but it is not artesian and will not come to the surface. The water works at my home town, Albuquerque, pump millions of gallons every twenty-four hours at the masonry wells they have inserted in this upper lake, and in very dry seasons when the upper lake becomes lessened in quantity after the pumping of billions of gallons, perhaps, they utilize these pipes to the second stratum and get that. Now, of course apart from the water that comes from the ranges of mountains to the east and west of the stream, most of the water in these underground lakes in all probability comes from the Rio Grande and has soaked in there in recent years. These lakes occur in gravel, and their flow is southward like the river on the surface, but much slower.

Sometimes these lakes, as at El Paso, are not to be found; they go off around the mountains sidewise. In fact right at El Paso, where they sounded for the international dam, they do not find lakes, but they find some water; but at San Marcial, in the Mesilla valley, these underground lakes are found and pumping plants dem-
4395 onstrate their presence. These underground lakes are not pure water but gravel and sand filled with water. That is what I mean. And the movement through that gravel and sand is slow. It is with the direction of the stream. Then because of the existence of these large underground bodies of water the irrigation possibilities are greater than many people appreciate. At places on the Rio Grande large quantities of water disappear, comparatively speaking, in short distances, then the river may remain equable in quantity for many miles, long stretches, and then lose vast quantities again. The Geological Survey measurements show that twice as much water passes San Marcial as ever passes El Paso, and the distance between them is some 130 miles, I think.

4396 The violence of storms in the mountains I think is often such that it is not practicable to hold or capture all of the flood water by any ordinary reservoir system. I do not think it would ever pay to put a reservoir in the minor tributaries up in the mountains of such vast size that it would catch all possible water that would fall; but the reservoirs put at the headwaters of a stream in that way together with those down the stream at different points ought to be large enough to hold it all, and that ought to be the object of all reservoirs. If you would put a reservoir at the headwaters of any tributary, up on the little branches big enough to catch any possible fall of water there, it would make the
4397 land you had to irrigate cost too much per acre. You never could do it. You would have to catch that excess flow farther down. And in order to completely carry out the reclamation service it will require reservoirs both in the up-stream and the down-stream States.

4398 I went to New Mexico in 1881, and it is my opinion that more water fell in that year than I have ever seen since in one year fall in the Territory, and all over that western country.

There are vast stretches of country in the Rio Grande valley at different places in New Mexico where you can walk over the ground now—and I have done it—and trample over the remains of irrigating ditches, and that land has not been irrigated in the last ten or twelve years.

4399 I am sorry to say that there has been a great destruction of timber at the head of the Rio Grande and its tributaries in the last ten or fifteen years, and I believe I will have to admit that the cutting of timber results in the quick flowing off of the
4400 water. I guess I will have to admit that the cutting and burning of the timber and the close grazing of the mountain lands, the trampling out and eating off of the grass and the destruction of the underbrush all tend to a quick disappearance of the snow in the

spring. The evaporation from snow lying on the ground is also much greater where it is exposed to the rays of the sun and the action of the wind than where it is protected by timber and
4402 underbrush. The development of the towns, cities, agricultural population, railroads, etc., in New Mexico, outside of the stock growing industry, is dependent in a very large degree upon the water used for irrigation.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4403 It is noticeable that the drouth I spoke of occurred since the use of water in the San Luis valley for irrigation in Colorado and that fact is often referred to as the cause of the drouth, and it is to some extent the cause of it. (Objection by defendants.) In speaking to the effect that water that is used for irrigation would go down and could be used repeatedly, over and over again, I did not mean to be understood to say that the total amount used at the first or upper irrigation goes down exclusive of any amount that is evaporated and goes into plant life. It goes down subject to all those deductions.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

4404 I think much more than a quarter of a million acres of land in New Mexico would produce a crop without irrigation. I don't think much more than that.

4405 GEORGE H. MAXWELL, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

My legal residence is in California at present. I am a practicing attorney. I was admitted to the bar in 1881. I practiced continually until three or four years ago. I am chairman of the executive committee of the National Irrigation Association, of which Thomas Walsh is the president.

When practicing law in California I had my offices in San Francisco, but my practice extended all over the State. I have tried
4406 cases in every county in California from the north end of the State to Santiago, in a continuous line. I practiced there seventeen or eighteen years. I was connected in a professional capacity with a case known as the Fallbrook Irrigation District vs. Bradley. That case involved the constitutionality of what is known as the Wright act, and that turned to a certain extent upon the physical conditions of California with respect to irrigation. I have

Sometimes these lakes, as at El Paso, are not to be found; they go off around the mountains sidewise. In fact right at El Paso, where they sounded for the international dam, they do not find lakes, but they find some water; but at San Marcial, in the Mesilla valley, these underground lakes are found and pumping plants dem-
4395 onstrate their presence. These underground lakes are not pure water but gravel and sand filled with water. That is what I mean. And the movement through that gravel and sand is slow. It is with the direction of the stream. Then because of the existence of these large underground bodies of water the irrigation possibilities are greater than many people appreciate. At places on the Rio Grande large quantities of water disappear, comparatively speaking, in short distances, then the river may remain equable in quantity for many miles, long stretches, and then lose vast quantities again. The Geological Survey measurements show that twice as much water passes San Marcial as ever passes El Paso, and the distance between them is some 130 miles, I think.

4396 The violence of storms in the mountains I think is often such that it is not practicable to hold or capture all of the flood water by any ordinary reservoir system. I do not think it would ever pay to put a reservoir in the minor tributaries up in the mountains of such vast size that it would catch all possible water that would fall; but the reservoirs put at the headwaters of a stream in that way together with those down the stream at different points ought to be large enough to hold it all, and that ought to be the object of all reservoirs. If you would put a reservoir at the headwaters of any tributary, up on the little branches big enough to catch any possible fall of water there, it would make the
4397 land you had to irrigate cost too much per acre. You never could do it. You would have to catch that excess flow farther down. And in order to completely carry out the reclamation service it will require reservoirs both in the up-stream and the down-stream States.

4398 I went to New Mexico in 1881, and it is my opinion that more water fell in that year than I have ever seen since in one year fall in the Territory, and all over that western country. There are vast stretches of country in the Rio Grande valley at different places in New Mexico where you can walk over the ground now—and I have done it—and trample over the remains of irrigating ditches, and that land has not been irrigated in the last ten or twelve years.

4399 I am sorry to say that there has been a great destruction of timber at the head of the Rio Grande and its tributaries in the last ten or fifteen years, and I believe I will have to admit that the cutting of timber results in the quick flowing off of the
4400 water. I guess I will have to admit that the cutting and burning of the timber and the close grazing of the mountain lands, the trampling out and eating off of the grass and the destruction of the underbrush all tend to a quick disappearance of the snow in the

spring. The evaporation from snow lying on the ground is also much greater where it is exposed to the rays of the sun and the action of the wind than where it is protected by timber and
4402 underbrush. The development of the towns, cities, agricultural population, railroads, etc., in New Mexico, outside of the stock growing industry, is dependent in a very large degree upon the water used for irrigation.

Recross-examination on behalf of complainant.

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devoted the last ten years almost exclusively to irrigation questions.
The last few years of my law practice very largely drifted
4407 into that field. I am very familiar with the conditions in some
of the States and Territories of the arid region by personal observation and from studying all available sources of information. I think I might say I am familiar with all of the Western States and Territories.

The arid region covers the entire west half of the United States, approximately, west of about the 98th meridian, with the exception of a strip of land lying between the Cascade mountains and the upper part of the Sierra Nevada range and the Pacific ocean. Of course in that entire area there are some mountain valleys and isolated sections of country, a very limited area, where crops will grow without irrigation, but in a general way I should say the western half of the United States, with the exception of the strip I have mentioned, is arid country. Of course that line I mentioned, the 98th meridian, is not a straight line north and south; it is a line which has some modifications from north to south and which varies back and forth somewhat with the seasons. In what is termed the arid region of this country crops cannot be successfuly raised from one year to another by the natural and usual rainfall and the development that has already been made was dependent upon
4408 irrigation. I think that the area of land actually and permanently provided with a water supply in the arid region which will produce crops in all seasons is probably less than seven million acres, although it may not be. Of course there is a very large area which is capable of irrigation in wet seasons and which is not capable of irrigation in dry seasons, and if that is all included it would enlarge the area very much. It is a fluctuating area; you cannot fix it absolutely.

In respect to the amount of land in the arid region which can be reclaimed by utilizing the waters of the streams there and by impounding the flood waters and using them, the Geological Survey has issued official reports in which the area is estimated at seventy-four million acres. I think Major Powell, when he was the director of the Survey, thought it might reach one hundred million acres. My own idea is that if we assume there is a visible water supply to-day for seventy-four million acres, in the future we will find
4409 that that amount will be doubled and trebeled, and possibly even more, by the gradual enlargement of the area which will be brought under irrigation as the country develops, through return seepage and better methods of cultivation which will show that less water is necessary, and, I think, in the planting of forests which will serve to conserve the water and possibly increase the rainfall. I don't think it is possible to fix it absolutely, that is as to the limit of possible development. I can illustrate that by the San Joaquin valley. In the minds of the old settlers of that valley it was a hopeless desert. To-day in many parts of it it is a beautiful irrigated country, and over large areas where originally the water

table was from seventy-five to one hundred feet from the surface it is now so close to the surface that it is injurious to fruit and some of the crops they produce, and the question has become one of drainage rather than irrigation, and there is not a doubt but that there is water enough available to irrigate every acre of land in the Sacramento and San Joaquin valleys. Within fifty years I should say one hundred and fifty million acres can yet be reclaimed.

4410 Without regard to the possibility of its future irrigation, that land in its present condition is worth very little—perhaps $1.25 an acre. Some of it would not be worth that. If reclaimed by irrigation the land would be worth all the way from $50 to $500 an acre.

In regard to the number of people this additional land when irrigated would support, I think the statistics of irrigated sections show that when an irrigated section of country with a reasonably moderate climate has been fully developed it sustains a population of from one to two per acre. I think it is safe always to estimate that if you have a certain number of acres of irrigable land in the long run it will develop a population of that many souls; I

4411 mean directly and indirectly. For instance, if we have seventy-five million acres in sight with a visible water supply I think it would be safe to assume that in time it would support seventy-five million people. There is one qualification I want to be clear on there: That opinion as to population is of course based on the assumption that the irrigable lands are sub-divided into farms of the smallest area that will support a family on each farm unit.

I am familiar with the riparian rights doctrine. In answer to your question as to whether the development which has already been had in the arid region with respect to agricultural and horticultural lands could have been made by a strict application of that doctrine, I should like to explain a little some of my views about the law of riparian rights. I should answer your question that it could not be developed, but I think there have been a great many decisions and opinions written and a great deal of conversation and talk about the riparian doctrine that has been based, to a very large extent, upon a wrong conception of what the law of riparian rights was even in England. As I understand the law of riparian ownership, it always recognized a concurrent right of use, and it was always a relative right when it came to a question of the rights of other owners, and I think a great many cases have been de-

4412 cided or opinions written without having in mind the flexibility of the law of riparian ownership, even in England, where it originally prevailed. But the application of the principle that the lower riparian owner is entitled to have the water come down to him undiminished in quantity and undeteriorated in quality, applied in its strictness to the west, would absolutely prevent its development. That is, prevent any future development; and with respect to present development, if you should apply it to-day to existing conditions, eliminating all questions of estoppel and

eliminating rights which have grown up to irrigate, which the courts have conceded by reason of riparian ownership as a reasonable use of the water for irrigation—if you should apply the law without these limitations you would destroy all communities in many places.

Should it be established that the irrigated area in the arid region should be confined to lands riparian to the stream, say the first and second 40's, its effect would be destructiue upon any future development in the arid region, and would cause an immense de-
4413 struction of present development.

If a doctrine should be applied that would confine the irrigated area to riparian lands it would practically render inoperative the reclamation act. Of course I want to make it clear that I do not concede that that is the law of the arid region. If it should be established that upon an inter-state stream the State where the stream heads or rises should be entitled to all the waters of that stream irrespective of the rights of any person below for irrigation purposes, the effect upon the reclamation act of 1902 would be to render it inoperative, except in those upper States.

I have made sufficient study of the arid region to know that one of the questions of prime importance in that region is the cultivation of the forests. I think the maintenance of the forests we have, at least, without further destruction, is essential to the preser-
4414 vation of the water supply that we now have; and I think the reforestration of areas that have been denuded and the planting of large areas of new forests could be made to largely increase those water supplies. Forestry can be increased by means of irrigation in the arid region. Many millions of acres could be planted and made to pay as a business investment. I think irrigation makes it possible to produce forests so quickly and of such a fine quality of tree that in a comparatively few years we could produce from newly planted forests enough timber and wood to supply all the needs of this country, if the forests were upon land
4415 that could be irrigated so as to get the necessary start. The raising of forests by irrigation for commercial purposes could not be successfully accomplished under the application of the strict doctrine of riparian rights, nor could these forests be successfully cultivated should the irrigated area be confined to riparian lands along the streams. I was at one time very familiar with the decisions of California with respect to irrigation, but I have not been as close to my law books in the last two or three years as I used to be.

In respect to the question as to whether the doctrine of riparian rights in the strict sense is enforced in California with respect to the waters of the streams in that State, I should say no, although we have some decisions there which have been based upon the riparian doctrine, which are unfortunate, to say the least, for the welfare of the State, and which I think were wrongly decided and will eventually be reversed. The particular cases I refer to are the cases of

Hargrave vs. Davis and Bathgate vs. Irvine. (Objection by
4416 defendants.) In regard to the case of Lux vs. Haggin, that case has been very much qualified and I never interpreted the decision in that case as going as far as some people did. A curious feature about the development of the law of water in California has been that in the early decisions the question of the relative rights of use received comparatively little consideration. The case of Lux vs. Haggin was really fought out on the square proposition that the law of riparian ownership did not apply and that the statute of appropriation practically created a right which took precedence over the riparian right, without going into the legal elements which have since very thoroughly been threshed out by the courts as to the relative rights of riparian owners and appropriators to the use of the water, and I think the drift of decision in California is entirely in the right direction. The last leading case there, the case of Katz vs. Wilkinsham, to my mind, is a mile-post on the road that is going to guide us in the future in the right direction, and that practically put the law there on the right basis, which is that the riparian law of England in its application to California must be interpreted in the light of the physical conditions that exist there, and that being done, the question becomes one of use, whether the basis of the right is riparian ownership or appropriation.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4417 As to what would be the effect upon the lower States if the mountain States had the right to take and control all of the waters that rise in them, assuming that they did take it all, and apply all of those waters to uses for irrigation within their own borders, of course it would be destructive of all irrigation
4418 development in the lower States. (Objection by defendants.) I think that nearly all of the streams on the west side of the Missouri river rise in what is known as the arid region. If the right to use all of those waters were confined to the crest States, of course it would have a very detrimental effect upon any of the lower States, to the extent of the destruction of their irrigation interests, which would have been extensive if those waters had
4419 continued to come down. And this would destroy all agricultural development dependent upon irrigation from the rivers rising in the crest States. (Objection by defendants.) If Colorado and Wyoming should take all of the water and dry up
4420 irrigation in the other States, the detrimental effects would reach from Maine to the Pacific ocean, from Canada to New Orleans. You cannot limit it. The commerce, transportation and industrial interests of the country are so closely interwoven that you cannot destroy any part of the country without affecting the entire country, and the effect is necessarily relative. It would have
4421 an enormously detrimental effect upon all the property of Nebraska that was not created by irrigation if Colorado and

Wyoming should divert all of the waters that rise within their borders and flow down. The same effect would apply to Kansas. Under this claim it in my judgment would render the national irri-
4422 gation act practically inoperative. (Objection by defendants.) This would be the effect of such a claim, if fully carried out, upon the three States of Nebraska, Kansas and New Mexico, and I would prefer to confine my answer to those three States, because I do not know that you could say that there are other States similarly situated. (Objection by defendants.)

4423 The question of return seepage is always a relative one. Now, from my knowledge of the eastern slope of Colorado I believe that in time an area of land could and would be brought under irrigation in eastern Colorado which would by evaporation and plant growth consume all the water which flows now across the State line into Kansas and Nebraska. In other words, my own judgment of it is that for a period of years the seepage would
4424 increase the flow of the stream but that eventually the area in Colorado would become so large that it would use all the return seepage and the South Platte and the Arkansas would be dry streams from the Colorado line down; and I think this would be to a very large extent true of the Rio Grande, though perhaps
4429 not so extensive. As to what effect this condition of taking all of the water in an up-stream State would have upon the contracting of the reclamation service to the crest States, so far as it could be applied to Nebraska, Kansas and New Mexico, I think it would render the national irrigation act inoperative below the line of Colorado on streams flowing out of Colorado and into those other two States and the Territory I have named. It would be enormously prejudicial to the development on the Colorado river below the Grand Cañon, but I do not think it could be said to entirely render the act inoperative because I do not think Colorado could use all of the water that rises in Colorado. It might be used in Colorado and Utah; I don't know how that is.

Cross-examination on behalf of defendants.

By Mr. DAWSON:

4432 If it be true that large tracts of land are irrigated in the valley of the Arkansas river in Colorado down to the Colorado-Kansas line, as conditions exist at the present time I believe there is a considerable amount of return water appearing east of the Colorado-Kansas line as the result of that irrigation, but
4433 it is not necessarily true that the return waters will continue to exist as they do and in all probability increase across the line into Kansas. I have watched the development very closely and I think there is a very strong tendency where water is very valuable to apply better methods of irrigation which limit the water used for the irrigation of a crop to the amount necessary to produce that crop without what is a waste as to that particular area in return seepage.

The amount that any one irrigator is entitled to use, as I understand, under the laws of Colorado, does not exceed what can be beneficially applied for the purpose of producing the best possible crop on a given area of land. Now, if there is return seepage from the irrigation of a large tract of land, there is at least as much water as comes back into the stream applied originally in excess of what was absolutely necessary, which could have been avoided by proper and more skilled methods of irrigation; and I want it understood that my opinion in this matter as to future developments is not based upon a continuance of the present methods of irrigation by flooding which generally prevail, each farmer using all the water he thinks he is entitled to and can get. I think the future development will very largely limit the amount used and that the return seepage will decrease in the future as the amount applied is less and less by reason of the application of better methods of irrigation—
4434 that is, more economical methods of irrigation. There is a very strong and proper movement now being carried on in the West for the adoption of more economical methods of irrigation. In a country where the ditches run full of water all the time as they do in some places, there is necessarily a very large waste of water, which goes into the land and does more harm than good, and there are a great many sections in the West to-day where they are doing great harm by applying too much water, and I believe that to a very large extent the alkali problem, which is a very threatening one in many localities, may be overcome by applying
4435 less water. I think it is largely true that in India and Italy and those countries which have practiced irrigation for many hundreds of years the seepage or return waters are greater than we find, generally speaking, in the arid region of America. I think it is equally true that a very large amount of return seepage is due to the very large application of water, and an excessive appli-
4437 cation. If you can apply water often enough in irrigating alfalfa by flooding you can obtain results from it without return or seepage waters, and I have seen that done. I have seen alfalfa growing in a great many countries where every drop of the water going into the ground would go into the alfalfa; no
4438 return seepage at all. I never owned a piece of irrigated land that I now recall, but I have lived on irrigated land, in the Salt River valley in Arizona, and I have been familiar with irrigation in that locality for several years. I was not there continually during that time, but have been back and forth there for several years. I was there continuously, I think, for
4439 six or seven or eight months. They irrigate there when they can. They have what they call their runs of water there and would irrigate when they could get the water in the dry season. In the wet season the ditches ran full, of course. The condition there is that a very large amount of water is wasted during the seasons or times when the river is high and then the river goes down and there is a very great short-

age of water during the other portions of the year. It is necessary
for irrigation, that is, of advantage, to so saturate the ground
4440 that there will be some excess of water in it to carry the crops
through the dry period, when it would not be necessary if the farmer could draw his water from a reservoir, for instance, at whatever periods it was most needed for his crops and in whatever amounts could be applied to the very best advantage without over irrigating. It is a proper use of water to put sufficient on the ground during the times of flush flow to make seepage or return water later on in the season, and that is the very point I have been trying to make clear in my testimony—that as conditions exist now and under the methods of irrigation that exist now there would be undoubtedly return seepage. Of course when I speak of the eventual disappearance of return seepage I have in mind that it is assumed—or at least I based that suggestion in my testimony upon the assumption that Colorado would have the right in future years, if she could by any method stop that return seepage and use it farther up on the lands, to do so, and I believe Colorado would develop ways of very economical use of the water so as to eventually use that
water higher up and prevent it from passing the line, even
4441 though it would be considered return seepage at this time.
In other words, I don't think there is sufficient water in the Arkansas, taking the twelve months through, to make it physically necessary that there should be return seepage, and if Colorado had the right as a matter of law to use that water, even though it might
now be considered return seepage, she would develop ways
4442 for doing it in the future. You can get better results from
the same amount of water if you use it near its source so as to avoid the evaporation and waste in transmission than you could by using the same amount of water farther down the stream, and I understand that the Arkansas has the characteristics common to all of the mountain streams which proceed out onto the plains on the eastern slope. That is, that it tends to disappear or lose its visible flow as it proceeds from the mountains onto the arid plains; that there is sand and material along the river that gradually absorbs a considerable portion of it; but whether there is any large amount of it diverted by an underground stream or anything of that kind, I don't think any of us know. I don't imagine there is.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

4452 In general terms, the objects and purposes of the associa-
tion of whose executive committee I am chairman is to aid
4453 and assist in the development of the arid region by irrigation
and to bring about the highest possible development of which that region is capable by the application of right principles of development.

I have not made any observations or study with respect to irri-

gation in foreign countries except through publications that I have been able to obtain. I never have been abroad myself. I would hardly be willing to admit that in Italy irrigation is developed to a greater extent and that the use of waters may be more intelligently applied than in this country. I think possibly that might be so generally, but I think the science of irrigation is as highly developed in southern California to-day as anywhere in the world. I don't know of any district in any foreign country where they have practiced irrigation for a number of years where they have overcome this question of return water. I can't say that I do. In cases I think it is true that in those countries where irrigation has been developed to a higher point than it has in this country they
4454 still have seepage or return waters. No, not in all places do I think it possible that you can overcome the seepage or return waters and utilize all of them. It always depends not only on the methods of cultivation and the amount of water applied but on the nature of the soil. I think it is a fact that irrigation has developed along more intelligent lines in recent years in Colorado and other irrigated countries than existed when irrigation was first practiced and that the seepage and return water is greater as times goes on than when it first commenced. That has been so up to the present time and it will be so for a good many years.

4455 Well, I do not want to be understood as taking the ground that the gradual elimination of return seepage is anything that will come about very soon. I think it will be a good many years in the future before it will come about, and then it would only come about if it were possible for the upper user to have the absolute right to the return seepage so as to stimulate them to adopt every possible device in order to get the use of that water and keep it from going down to somebody else. Yes, there is a great deal of seepage from the main ditches and the laterals themselves if the soil if at all porous. As to whether that seepage finds its way back to the stream, that depends upon whether the ditch is near enough to it. Well, it might be in the same water shed and still not get back. Of course there is a limit to the distance. No, you could not overcome the seepage unless you cemented both your main and lateral ditches. But I am disposed to think that in the future, at least where water is very valuable, an uncemented ditch will be an unknown thing. We have practically come to that in California. But about that mat-
4456 ter of return seepage, I believe the changed conditions which I am talking about would probably be a great many years hence, fifty or a hundred possibly, but in the consideration of the question as to what the eventual condition is going to be, by conceding that right to the upper State, I think that the water will eventually become enormously valuable and they will find methods to prevent the return seepage in years to come, but that it will come in your day or mine I do not believe.

Recross-examination on behalf of defendants.

By Mr. ASHBAUGH:

4457 If the present methods of irrigation and the application of water continues, I think the construction of reservoirs to conserve the flood flow so that it will be held back and carried through canals and used for irrigation within a reasonable distance of the river would increase the return seepage. In other words, under irrigation as practiced at present a larger area under irrigation will produce more seepage and return waters than a smaller area, and the fact that it is a fact is entirely in harmony with the idea I expressed before, that in future years those conditions might be changed and probably will be changed. The question of the value of water in the West is going to be a very different problem when we have one hundred and fifty or two hundred million people in this country than it is to-day when we have only seventy-five or eighty million.

4459 W. L. JONES, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside at North Yakima, in the State of Washington. I am a member of Congress from that State, just closing my third term. I have resided in Washington since the spring of 1889. It is estimated that somewhere about one hundred and twenty-five to one hundred and thirty thousand acres of land have been reclaimed from its arid state by irrigation in the eastern part of Wash-
4460 ington. A great many thousand acres more can be reclaimed from its arid condition in eastern Washington by utilizing the waters of the streams there and by storing the flood and other waters. Without irrigation this land in its present condition is practically worthless. There is some of it of course fit for grazing to a certain extent in the spring, but that is sage-brush land. If this land were reclaimed by irrigation it would be worth from thirty-five to a hundred dollars and acre. As to the population that the lands that are now arid would sustain if reclaimed, we usually consider that if we could reclaim all the lands that it is possible to reclaim at what would be considered a reasonable expense it would support in that section a million people. The central portion of Washington is practically an arid region.

4462 Our supreme court has held that the doctrine of riparian rights applies in our State. We have not had a great deal of trouble in the immediate vicinity of the arid belt in Washington as yet, but if the doctrine were applied there, I think, in its extreme sense, it would cause us a great deal of trouble. This doctrine without some modification in the application of it would very materially

retard development in the arid belt, I think, and would also
4463 affect present development very seriously. Of course some rights have probably been acquired by prior appropriation, but on several streams there if the doctrine of riparian rights were enforced it would shut out a great deal of the present irrigation.

In respect to the future development of the arid portion of Washington, aside from taking the water out of the Columbia river, I think it would affect it very seriously. So far as I know, this doctrine laid down by the supreme court has not been followed strictly. Of course the same question came up in a case there from my vicinity in which that doctrine was declared, and yet since the decision was rendered nearly every year we have had plenty of water.

There has been plenty of snow in the mountains and they
4464 have not been troubled with a shortage, so there has not been any particular trouble. There has not been any real test of what would be the practical effect of that decision I have spoken of. My judgment is that if it ever is enforced it will seriously retard development. I don't see how it could be otherwise.

If the irrigated area should be confined to the lands adjacent to the stream in the arid regions of Washington, other than on the Columbia river, that is, the first and second 40's, the effect would be that there would practically be no development.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4465 The Yakima river rises in the Cascade mountains and flows into the Columbia. The Columbia has one fork which rises in Montana, and one comes down from British Columbia. If British Columbia should divert all of the water of that branch of the Columbia river, I don't know just what proportion of the
4466 water would be shut off. (Objection by defendants.) If all of the water of the Columbia river rising either in Montana or in British Columbia should be shut off at those lines there is no doubt but there would be a very material diminution in the amount of water. There is not to any considerable extent any irrigation along that branch of the Columbia that rises in Montana below the Montana line in the State of Washington. If the State of Montana should claim and exercise the right to divert all of the water of this branch of the Columbia they would not have any water for irrigation; but that section of Montana through which that branch of the Columbia flows has very little irrigation on it. (Objection by defendants.)

4467 The supreme court has decided the doctrine of riparian rights to be in force in this State in the case of Benton vs. Joncox. This is the first case in which that question was involved, and it has been followed and applied since that time. When that

case was decided I think a majority of the judges were from eastern Washington who decided that case. (Objection by defend-
4468 ants.) It is true that a great part of the valuable portion of the State of Washington is on the west side of the Cascade range, where the doctrine of riparian rights would be applicable, although the most valuable part for agricultural purposes in on the east side. It is largely timber on the west side. The commercial cities are on the Sound there. The largest agricultural cities are on the east side. In the eastern part of Washington we have some very large wheat fields and raise a very fine quality of wheat as
4469 well as a fine quality of barley, and these are in regions where crops are not raised by irrigation. It is in this region that that case arose. (Objection by defendants.) I don't think there the doctrine of prior appropriation would affect that particularly.

Cross-examination on behalf of defendants.

By Mr. HAYT:

The average rainfall in the county in which I live is from ten to twelve inches. At North Yakima I think it is only about six to eight inches, and you go farther down, to Pasco, and I
4470 think it is still less. In the sections where we irrigate we can raise scarcely anything without irrigation. Now, in the sections where they don't irrigate they raise, generally, different crops from what they do in the irrigated sections. For instance, in the eastern part of the State, in the wheat country, they raise wheat. We raise but little wheat in the irrigated section because we have to get crops that will be more productive, and we raise different crops there. The irrigated section produces the most in money. I know of families in and around North Yakima, for instance a man and his wife—and I don't remember now about the children—they make a good living on five acres; and there are many ten-acre farms there and many fifteen and twenty acre farms. Where they raise alfalfa eighty acres is all that a man can take care of, and that will support about any ordinary size family. The tendency of irrigation is decidedly to reduce the ownership of land to small tracts and to intensify the cultivation.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4471 I don't know of any section in the State of Washington that is being developed and irrigated at the expense of any other section. (Objection by defendants.)

4473 Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

The Washington legislature is now in session, and there is an irrigation bill pending there. Just what its provisions are I don't know. It is for the purpose of getting the law in condition so that the reclamation act can be enforced in that State.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

The State of Washington has two different conditions naturally and physically, caused by the range of mountains. One of them is at the east, in which there is some arid land, and one at the west, in which the lands are not arid.

4476 THEODORE A. BELL, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside in Napa, California, and am a delegate in Congress from the 2nd district of that State, in the present House. I am a member of the House Irrigation Committee and was appointed on that committee at the beginning of the 59th Congress. I was born in California. My knowledge of California north of the Tehachepi, that divides the State into two sections, is from personal observation a good deal, but southern California I know most about from hearsay, having visited there only once or twice.

4477 About a million and a half acres, perhaps a little more, have been reclaimed from their arid state by reason of irrigation in California. As to whether this million and a half acres could have produced a crop by the rainfall we have out there, I will say that California has a rainfall ranging from almost nothing in the extreme south to a hundred inches on some parts of the coast ranges, and we have three areas—arid, semi-arid and humid. They irrigate in all three. In southern California it was so arid that the land was practically worthless without irrigation; then as you go farther north and get just above Tehachepi, in the San Joaquin valley, you have there an arid condition that gradually goes into a semi-arid, where they raise crops of wheat, barley, etc.; and then progressing northward you find in the Sacramento valley no arid lands at all. The rainfall, I suppose, runs from twenty to thirty inches there, yet irrigation is increasing all the time, and its value has been demonstrated even in the northern part of Sacramento county. I should judge about one-third of the million and a half acres that

have been reclaimed by irrigation are in the arid belt, and
4478 pretty nearly all the balance in the semi-arid belt. Irrigated lands in the vicinity of Riverside, for instance, where there is a population of 13,000, and an acreage of 10,000 acres supporting a population of 13,000 people—the land there reaches its greatest value, and I guess runs up to $1500 an acre; but the average value of our irrigated lands in California, I think, to be exact, is $89.14 an acre, taking the whole State. My judgment would be that twelve or fifteen million acres can yet be reclaimed in California provided that the flood waters which now go to waste could be utilized. That is a low estimate in comparison to what others have made. Estimates have been made of our hundred million acres in California that thirty million acres of it can be subjected to irrigation; but I think that is rather optimistic. I would rather say ten, twelve or fifteen million. Fifteen million it seems to me would be pretty high. I mean including the million and a half already
4479 reclaimed. In respect to the worth of that land at the present time that has not been irrigated, there are pretty nearly three million acres in the Sacramento valley that you might class as semi-arid that is worth perhaps now $15 or $20 an acre. With water upon them they would easily be worth $100 to $150 an acre. The lands which can be reclaimed that I have spoken of I should say when reclaimed by irrigation would be worth on
4480 an average $100 an acre, and the population would be increased ten fold.

The strict application of the doctrine of riparian rights would very materially affect the development of our State. As to the extent, that is pretty hard to answer exactly. The strict doctrine of riparian rights has never been applied to California, though the supreme court upheld that doctrine in the case of Lux vs. Haggin. But the doctrine that now prevails there is a sort of a privileged right of appropriation—privileged on the part of riparian owners—and our supreme court has now said that every case must rest upon its own bottom and be decided upon the particular circumstances and conditions of that case. But there is a distinct line drawn between riparian ownership and the clean-cut right of appro-
4481 priation. We have our statute, of course, as is a matter of common knowledge, permitting the appropriation of the waters of running streams. Our supreme court, as between an owner on the banks of a stream and the one who desires to divert the water from that stream and take it away to lands not immediately adjacent to the stream, always decided, of course, in favor of the riparian owner; but there is no confusion there as between the right to appropriate the water and take it away from the lands of a stream—lands upon the banks—and the riparian right; but when it comes to a question as between owners on the same stream, then they have gone as far as to say that each man is entitled to the flow of the water and the use of the water for domestic purposes and for "reasonable" irrigation, leaving it in every case to be determined

what is reasonable irrigation; so that it is in very unsatisfactory shape. The doctrine of riparian rights as laid down in the case of Lux vs. Haggin of necessity has given way and did give way in that case to the circumstances and conditions of the State generally, I judge. I think the strict application of the doctrine laid down in
Lux vs. Haggin would have interfered with the future devel-
4482 opment of the State. Decidedly so. Because the strict ripa-
rian right does not look to the fullest use of the water for beneficial purposes. It is irreconcilable with that theory. Should the irrigated area be limited and confined to riparian lands, or in other words to the first and second 40's bordering on the stream, the effect would be to reduce the opportunity for development from one hundred to five hundred per cent. I should judge to a very small percentage. As I understand the reclamation act, it is diametrically opposed in theory and practice to riparian ownership, in this, that the reclamation act looks to the very largest and most extensive use of the waters for beneficial purposes while the riparian right is, you might say, an aristocracy in water—it is a special privilege.

4483 Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

California more than any other State in the Union has a great variety of conditions and interests, and perhaps more than any other country in the world. I think it is true that these varied interests are such that no one series of laws can be applied to all in our different physical conditions. There are parts of our State that may be reasonably called arid, other parts semi-arid and other parts humid. It is partially but not altogether true that that very sharp distinction, and our State having these different conditions, is the reason
for the construction given to our laws which adapt them to
4484 these different conditions. (Objection by defendants.) I am
not aware of any case in California where the court has overruled the doctrine laid down in ths case of Lux vs. Haggin. The
doctrine as there stated has been largely modified by
4485 subsequent decisions. (Objection by defendants.) The courts,
however, have decided the questions broad enough so that they might take up each case and decide it according to its own peculiar circumstances and conditions. The courts have recognized the different physical conditions in different parts of our State and
have a desire, of course, to put the waters of streams to the
4486 largest beneficial use. I do not understand that the courts
have attempted to reconcile the interests of riparian owners and the interests of appropriators who attempted to appropriate water under the statutes of California. They have not gone so far as that, but they have modified it so as to permit the largest possible use of the water among riparian owners themselves. I think that is the practice of that State in a nutshell.

4488 The Colorado river rises in another State and flows into California. It forms the lower boundary, and the waters of that river are being used in California. The Klamath also rises in another State, and there are a number of those streams that flow out of the Sierra Nevadas that rise at the apex of the mountain range, but I think that all of them rise in California. I think that the streams going into Nevada rise in California. There is one river, the Owens river, which rises in Nevada and flows into California.

Cross-examination on behalf of defendants.

By Mr. HAYT:

4489 This uncertainty with reference to the law as laid down by our supreme court that counsel has alluded to to a considerable extent I think has had the effect of retarding the development of California by irrigation.

The lands in our arid region without water at the present time are worth nothing, and those same lands with a proper system of irrigation and sufficient water to irrigate them would be worth from $150 to $200 an acre. That would be in southern California, in the semi-tropical country where they are now raising lemons, oranges, and things of that character. Of course some of those orange lands run as high as $1,000 an acre, but I should say generally
4490 $200 an acre for raising fruits. In the semi-arid region the lands are worth, without irrigation, from $15 to $20 an acre, and with irrigation, in my judgment, they would be worth $100 an acre. In that portion of the State where crops are raised without irrigation a fair average value of the land at the present time for grain would be $40 an acre and for fruit from $75 to $350 or $400 an acre. The lands irrigated in the State generally are more productive than even in the most moist sections. The tendency of irrigation is to reduce the number of acres held by one individual, and it also has a tendency to induce a higher state of cultivation of the soil.

4491 I live in the humid section of the State, about forty-five miles north of San Francisco, and probably sixty to sixty-five miles from Sacramento.

With irrigation we get a greater variety of crops and would be able to get a crop at least once a year where now we have to alternate and summer-fallow and are confined to grain raising, and that is the reason that the lands in the semi-arid regions, instead of being worth $20 an acre, would be worth something like $100. At
4492 Modesta, in Stanislaus county, the greater portion of the land there they don't attempt to irrigate at all, but with irrigation it would make one crop certain each year and permit a diversification of crops and more intensive farming, and for that reason land would increase in value, as has been fully demonstrated.

4493 FRANK W. MONDELL, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside in Newcastle, Wyoming, and am a member of Congress from that State, and am chairman of the irrigation committee of the present lower house of congress. I have resided in Wyoming
4494 since 1887. I was first elected to Congress in 1894. I was a member of the State senate for two years and mayor of my town and president of the State senate. I am familiar with the conditions prevailing in Wyoming. I have been around over the State very generally on business and in campaigns. According to the best of my information, there are now under irrigation in Wyoming aoout a million acres. When I went there in 1887 I should say there were about two hundred thousand acres. The average value of these lands is about $25 an acre. From a rather careful estimate made at various times, I am of the opinion that with the unused waters of the streams in Wyoming and by impounding the flood waters we will ultimately irrigate upwards of five million acres—four million in addition to the lands already under
4495 irrigation. The greater portion of the land that is now not in irrigation is practically valueless. I think there is very little of it that is worth $1.25 an acre in its raw state. If it should be reclaimed by using the unused waters of the streams and by using the flood waters, in ten years after reclaiming it would be worth on an average $40 an acre; and directly and indirectly two and a half acres of irrigated land in Wyoming will support an in-
4496 habitant. I should say possibly sixty per cent. of the assessed taxable value in Wyoming has been created and exists by reason of irrigation.

The lands that have already been irrigated and reclaimed from their arid state could not have been so reclaimed had the waters in the streams there been allowed to run unobstructed and undiminished. Should that doctrine be established now these lands which have been reclaimed would revert to their arid state. About sixty-five per cent. of our people in Wyoming now depend, directly
4497 and indirectly upon these irrigated lands. If we were not allowed to use the waters of the streams for irrigation purposes there would be practically no further agricultural development. There could be no development except such as might come from the mines.

If it should be held that the irrigated area in Wyoming must be confined to lands adjacent to the stream, that is, the first and second 40's, the effect would amount to nearly a total destruction of the irrigated area and would curtail future development by reclamation at least ninety-five per cent., I should say.

4498 The committee of which I am chairman in the House reported the bill which is now known as the reclamation act. I am familiar with its provisions and have made a study of it. I was a member of the committee of seventeen that framed the bill and was a member of the House committee that reported it, and reported the bill to the House and managed it on the floor during the discussion.

4499 I know what is understood as the doctrine of riparian rights. In the discussion by the committee of seventeen I think the members of the committee assumed that the doctrine of riparian rights would not and did not apply generally to the territory. As I understand, the doctrine of riparian rights, if rigidly enforced, would be fatal to irrigation to any extent. The reclamation act could not be operative, I think, in a territory where the doctrine of riparian rights exists and is in force and effect.

4500 Should it be held that the irrigated area must be confined to the first and second 40's bordering on a stream, I do not believe there is a project in the United States that could be carried out under the reclamation act. I think that probably three million acres of land may yet be reclaimed in Wyoming under the provisions of the national reclamation law.

I am familiar with the provisions of the act of Congress known as the Carey act, passed August 18, 1894. The establishment of the doctrine of riparian rights would be fatal to the operation of that act in Wyoming, and it would make impossible the development that has already been made under the act, for so far as I know no riparian lands have ever been irrigated under the act. I know that eighteen thousand acres have been reclaimed under the Carey act, known as the Germania flats in Big Horn county; that under the Cody canal in Big Horn county about 15,000 acres have been reclaimed and irrigated under that act, and the canals cover

4501 probably 10,000 acres more that will be irrigated within a year or two. None of the Germania lands are riparian lands, none of them being within three miles of the stream from which the water is taken—the Gray Bull. Of the Cody lands I should say that five per cent. of them are within a mile of the stream from which the water is taken—the Shoshone. There have also been irrigated on the Big Horn in Big Horn county several thousand acres under the Carey act.

The Oregon Basin enterprise, so-called, in Big Horn county, proposes the irrigation of upwards of two hundred thousand acres of non-riparian lands under that act. There are several other enterprises,—the Big Horn County canal on the Big Horn river that proposes the reclamation of twenty thousand acres, a large project on the upper Platte in the vicinity of Saratoga; a project on the upper Green known as the Boulder Lake project, and a number of other projects under construction; also the Whalen Cañon canal on the lower Platte. There are a number of other projects that I do not now

have in mind. There is also a project on the Poudre river at
4502 the base of the Big Horn mountains. That has about seventy thousand acres. In respect to the amount of money which has been expended under the Carey act in Wyoming, the lands and water rights have averaged in the vicinity of $16 an acre to the purchaser. In some cases they have cost more than that. In addition to that of course has been the expense to which the settlers have gone in building laterals and in preparing their land for cultivation, which probably would be $5 an acre more.

All these enterprises I have spoken of are on tributaries of interstate streams.

The future development of Wyoming is dependent in a larger measure upon irrigation or the taking of the waters of the streams for the purpose of irrigating desert lands than upon all other sources of development and growth.

Cross-examinatton on behalf of complainant.

By Mr. ASHBAUGH:

4503 Before there was any irrigation in Wyoming, speaking of the lands that have been irrigated, practically all of them, or a very great proportion of them, produced nothing prior to reclamation except a very sparse growth of grass, sage-brush, cactus, etc., and quite a percentage of the lands that have been irrigated in Wyoming produced no vegetation at all except a very thin, scattered growth of what is known as salt sage. These lands prior to irrigation were such as are generally denominated arid lands. In places, particularly on the small streams, there are small tracts here and there where the lands lie low, but slightly elevated above the ordinary flow of the water, where there was a better growth of grass than on the territory outside, generally. So far as agricult-
4504 ure was concerned, the aridity of the lands extended down to the banks of the stream, and that is very generally true of the lands in Wyoming that border the stream.

The Little Laramie rises in Colorado and flows into Wyoming, as does the Big Laramie and various tributaries of the Platte. The Platte river itself rises in Colorado, the North Platte flowing through Wyoming and into Nebraska.

4505 In speaking of riparian lands I meant lands that were near the banks of the river, regardless of their condition, even though the river was flowing through a moderately deep cañon and they were not saturated and were not subject to a natural growth of vegetation, and regardless of how deep below the surface of the lands the body of the stream may flow.

4506 The committee of seventeen that framed the bill held seventeen meetings, and we discussed practically every question relating, directly or indirectly, to the question of irrigation, and I recall one occasion when there was some considerable discussion

as to the doctrine of riparian rights and the abrogation of that by certain States and the modification of it by others.

4407 Because of the physical conditions of Wyoming, I believe it would not have been wise, and in fact would have been fatal to our development, to have adopted the doctrine of riparian rights. Following that up and knowing and understanding the physical conditions and physical needs for the development of my State, as a respresentative from Wyoming I assisted and did what I could to establish the reclamation act known as the act of June 17, 1902. We had in mind the entire arid region in drawing the bill. We were not establishing a law for any region not included in the provisions of the bill, but were attempting to draft a bill that would be applicable to the territory over which it extends,

4508 and that is the arid region of the United States, and a part of it is called the semi-arid. As to the effect in fact upon the irrigated districts of Wyoming if after the irrigation had been applied to Wyoming, Colorado should claim and exercise the right to take all of the water of those streams at the State line between Colorado and Wyoming and apply it to irrigation in the State of Colorado, and there were no other waters returning to the stream either by seepage or otherwise, then our prior appropriators would be greatly injured and their property entirely destroyed or its value greatly reduced. (Objection by defendants.) If it were pos-

4509 sible that the diversion of all the waters in Colorado were carried on to an extent or in a manner that none of it would return in seepage, then the loss to our appropriators would be

4510 very great. (Objection by defendants.) If all of such waters were taken out in Colorado and none of it returned in any way, their loss would necessarily be total.

I am acquainted with Sand creek, running in from Larimer county in Colorado, into Albany county in Wyoming. My

4511 information concerning the alleged state of affairs as to the conflict over that stream has been obtained somewhat from newspapers and casual conversation. I know that there has been some complaint on the part of settlers on Sand creek that they either had been or were threatened with loss of water by threatened diversions in Colorado.

4512 In respect to the preparation of the reclamation act and as to the intention in framing and passing that act that one State should have the right by virtue of her State sovereignty and her constitution to take and appropriate for irrigation purposes all of the waters that fall within her borders regardless of the prior conditions of the people and of the settlements below the borders of that State on streams flowing from the upper State into the

4513 lower State, I will say as a member of the committee that framed the law that it was not my thought or intent that we should by the passage of that legislation encourage that kind of practice. If any State were to insist upon and uphold the diversion of waters entirely regardless of prior appropriators in another State

below, and that were carried out, it might entirely deprive settlers in the lower State down the stream, under a Government project, of their water, or even under a private project if the conditions
4514 were carried out in the upper State. (Objection by defendants.) If such a claim as that should be made and carried out by the upper State without regard to prior appropriators in the adjacent State farther down the stream, I should say it would have the effect of contracting the reclamation service to the upper State, and it would have that effect very largely in the States farthest down on an inter-state stream.

4516 Practically, I have no knowledge as to return waters in the Arkansas valley within the State of Colorado.

Cross-examination on behalf of defendants.

By Mr. DAWSON:

4517 The enforcement of a doctrine which would hold that each State was entitled to all of the water arising in it would not practically work a destruction of the purposes of the reclamation act, as it would not necessarily affect the State having the headwaters of a stream. Taking a concrete illustration, if Colorado has the headwaters of a given stream, the application of that doctrine would not affect Colorado on that stream, and if Wyoming is below Colorado on the same stream and that stream collected certain waters within the State of Wyoming it would not affect the application of that act to those waters and that stream in Wyoming, and if still lower down the stream Nebraska had the same stream coursing through it the act could be applied to the waters of that same stream originating within the lines of Nebraska, if there were such
4518 waters in sufficient quantity. The reclamation act of course cannot be carried out unless there is a considerable flow of water, because under its provisions it cannot economically and reasonably apply to small projects. It is true that in each of the three States just named and in most of the Western States there are some streams which originate in the different States. In Wyoming we have streams originating in that State. The application of the doctrine that each State is entitled to the water originating within the limits of the State would not affect those streams injuriously which originate in the State of Wyoming. In other words, I think the effect would be to limit the operation of the act rather than destroy it, in each given State, to the waters originating in that State. If I might use a concrete case as an illustration, the reclamation
4519 service is proposing a project on the North Platte for impounding waters in what is known as the Pathfinder reservoir, and perhaps to reclaim lands both in Wyoming and Nebraska. If it were possible to use all of those waters thus impounded, together with the present unappropriated flow of the river in Wyoming before reaching the Nebraska line, and that were done, so far as Nebraska is concerned it would amount to a repeal of the act,

virtually, on that particular stream. But it would not prevent the operation of the act on some project in Nebraska where the waters of a stream originate in Nebraska. It is true that practically all of the mountain streams of any considerable size leaving the mountains on the eastern slope at certain times carry such an excess amount of flood waters as to make the use of all of that water in the State in which the stream originates impossible or partially impossible under the natural conditions without storage, and I think it is probably true that with regard to some of the larger streams proceeding from the eastern slope of the
4520 Rocky mountains that carry such an excessive amount of flood water that it would be practically impossible to even store all of that water within the limits of the State within which the stream originates. I think if the cost were not prohibitive it would be possible to reservoir a great portion of the flood waters on many of the streams, and I think that in many cases under present conditions it would be unprofitable commercially to build works of sufficient magnitude to capture the torrential floods that the larger streams carry at times, but it is my opinion that so far as the streams flowing eastward from the Rocky mountains are concerned, in the course of time practically all of the flood flow will be controlled. I think it is undoubtedly true that to capture all of the great floods of those largest streams reservoirs will probably be necessary not only near the headwaters of the stream in the State of its origin, but in States lower down the stream to catch that which passes
4521 the first works. As conditions now exist on the larger streams, proceeding from the eastern slope of the Rocky mountains, there are times when there is a great deal more water going down the stream than is either utilized for direct irrigation or captured for storage purposes, so that such excess waters which now go down the stream and go to waste are waters that are in fact unappropriated for irrigation purposes, and an appropriation that is prior in time is prior as a matter of fact, so that if there are waters flowing down now in any stream in the arid region that have not been impounded, whoever first impounds them has the prior right. The condition is such now that if impounding works were built in the down-stream States at this time there are excess unappropriated waters that may be captured.

4522 The committee on the reclamation bill was an unofficial committee consisting of one member from each of the arid States and Territories, with the exception that Wyoming had two members on the committee, Senator Warren being chairman. The States represented were Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington and Wyoming. After the bill was actually introduced in the House the Committee on Irrigation of Arid Land had charge of it and the representation on that committee was: Thomas H. Tongue of Oregon; John J. Jenkins of Wisconsin; George W. Ray of New York; Wm. A. Reeder of

Kansas, Frank W. Mondell of Wyoming; George Sutherland of Utah and Charles Q. Tirrell of Massachusetts.

All of the committee of seventeen which drafted the bill as it was finally presented agreed to it; that is, there were many sharp differences of opinion on that committee, and on a good many points we took a number of votes and there was a very great deal of discussion and consideration and reconsideration, and on some features of the bill there were half a dozen different views taken at one time and another, but the members of the committee finally all agreed to support the measure so far as reporting it to the respective houses was concerned. The bill was very considerably amended by the committee of the House on Irrigation of Arid Lands. The bill passed the Senate in the form in which it was reported from the committee of seventeen without any amendments whatever. In this committee the bill was amended in a number of particulars. As
4523 I recall, some five or six amendments were made to it, and the bill as finally amended and passed was not agreed to by all of the committee of the House. A minority report was filed by Mr. Ray of New York of the committee and signed by Messrs. Ray and Jenkins from New York and Wisconsin respectively.

We of the committee of seventeen understood that the doctrine of riparian rights did not apply to the arid States in full force and effect and as affecting those portions of certain States within which the law would operate if at all in those States, notably the States of Kansas and Nebraska. Some of the committee of the House on irrigation were representatives from the humid States. I think that Mr. Ray, of the committee, from New York, and possibly Mr. Jenkins, from Wisconsin, based some of their objections to the bill
4525 on lack of knowledge and opposition to the general law of diversion—that is, the doctrine of appropriation. A minority report was filed by those gentlemen, which I think is available. (Objection by complainant.)

Up to the beginning of the present fiscal year the amount realized under the reclamation act is a little less than twenty-four million dollars. I don't recall that in any discussion of the matter an estimate was ever made of the amount which might ultimately be realized from the sale of public lands in the States and Territories to which it applied. It was impossible to make any kind of an estimate, because it all depended upon the laws by which those lands might be disposed of and the extent to which the Government might dispose of them, and it is impossible to form an intelligent opinion. It is true that building or construction has been commenced in a number of States on a number of projects under the provisions of this act and that considerable money has been
4526 expended up to the present time.

First, I think the enforcement of the strict common law doctrine of riparian rights would interfere with the operation of the Carey act, because the enforcement of the strict doctrine would practically prohibit all reclamation by prohibiting all diversion and

thus making reclamation impossible; and further, speaking of the projects under that particular act in our State, it has occurred that in almost every instance they have been for the reclamation of non-riparian lands—bench lands generally, some distance back from the stream. The operation of the reclamation act and also of the Carey act must presuppose the appropriation of water from running streams either for direct application to the lands or for the
4527 storage thereof, and without this diversion both of these acts would become practically inoperative.

My experience with return or seepage water is based upon observation, and in some instances rather careful observation, but not at all upon measurements, and my observation has been that a very considerable amount of the waters used in irrigation are returned to the streams, the amount depending, of course, on many factors—the amount of water used in irrigation per acre for a given unit, the character of the soil, the distance of the land irrigated from the stream, etc. Many things enter into the question of the amount of seepage, of course the most important of which is the amount of water originally put on the soil. But my personal observation is that a much larger percentage of the water used in irrigation returns to the stream than has generally been supposed by people who have knowledge of irrigation. It is undoubtedly true that whenever any considerable tract of land is irrigated for a period of years it will return a certain amount of seepage water. Whether it returns to the stream from which it is taken depends upon whether it is taken out of the drainage. But it will furnish a consider-
4528 able amount of water. I have never seen any system of irrigation so perfect that a considerable tract of land could be irrigated for a period of years without furnishing seepage or return waters. I cannot conceive of a system that would not furnish some return waters. I think that the equalizing effect upon the flow of streams in my State of the irrigation of large tracts of land bordering on the stream is very decided. I have in mind as an illustration a small stream about four miles from my own town, which is Newcastle, Wyoming, a stream which I see very often. It is a stream known as Stockade Beaver creek. I have known of the stream for eighteen years. I have never made any measurements of it, so that my statements with regard to its volumes are simply from observation and reflection, but when I first saw the stream eighteen years ago there were perhaps 250 or 300 acres of land—possibly 300 acres—irrigated from it. The acreage irrigated gradually increased until about ten years ago there began to be complaints of shortage of water, and at that time possibly there were 450 acres irrigated from the stream, and the general impression was that we had reached the limits of irrigation from that stream. The lower ranch which it irrigated was one of considerable size as ranches go. It had ten years ago
4529 perhaps 250 acres under irrigation and the stream below that lower ranch was always dry during the irrigation season. Irrigation has gone on until I imagine there are a thousand acres

irrigated from the stream, including this lower ranch, which was supposed to be the limit. It is the lowest ranch down the stream which has a perpetual water right, but some six or seven years ago parties took up some lands below the lower ranch and applied for water rights for flood waters, such waters as are available. It is not, however, a flood stream in the usual acceptation of the word. It is a stream of a pretty steady flow. In the last three or four years some three or four hundred acres—or possibly not over three hundred and fifty acres—have been irrigated below the lower ranch—the "L. A. K." ranch—and the people owning those ranches contemplate considerable further extension of the irrigated area, and the water flow is sufficient to warrant them in their expectation of being able to increase their irrigated area very largely; so that that stream irrigates now and furnishes water, ordinarily, which will be used for irrigation in the near future, for sixteen or seventeen hundred acres of land. Its original estimated capacity was considerably less than one-half of that—nearer one-third. The increased capacity is due partly to economy in use, but very largely to
4530 seepage and return waters. Some of those farms irrigate early and late when the waters would not ordinarily be utilized at all otherwise. The stream is a perennial stream now ten miles farther down its course than it was eighteen years ago when there was less than one-fourth of the irrigation there is now.

The beginning of the irrigation season in Wyoming with us is a time of high water, generally. Depending on the character of the soil, of course, very largely, the water taken out of the streams at times of high water and spread over a great deal of ground returns through the soil to the stream when the natural flow is practically at its minimum; but in the ordinary soils of our river valleys the percolation is rather slow and my experience is that the return after a long term of irrigation is quite continuous throughout the entire year; and it is because of these things that I have said and have given by way of illustration that I am led to believe that the use of water along the stream for irrigation tends to equalize the flow of the stream, reducing the maximum and increasing the minimum.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4531 The reclamation act was passed June 17, 1902, which was some three months after the Supreme Court of the United States overruled a demurrer of Colorado in this present case.

There is unquestionably a great loss of water in irrigation by absorption in plant life and by evaporation. I do not pretend to say that you can increase the annual flow of a stream by taking water out of it; but irrigation takes water from a stream oftentimes during flood periods. Whatever seepage there may be returns gradually, and the return in many instances is the greatest in times of
4532 low water, so that there is an equalization of the flow. But

in this estimate the evaporation and absorption by plant life
4533 must be taken into consideration. The evaporation is considerable under any circumstances.

If all the flow of a stream were taken in successive ditches, each in turn taking the seepage as well, of course all the water left for the flow of the stream below the lowest headgate would be
4534 simply the return water from the last ditch. Well, if it is a fact that the waters of the Arkansas are all taken out in eastern Colorado continuously, the amount of water which would reach the adjacent territory below would necessarily be the amount of seepage water returned from not only the last ditch but the various ditches, because while our knowledge with regard to these matters is possibly not very profound or thorough, the general impression is that underground waters, particularly on streams like the Arkansas, flow for a considerable distance and that the seepage from a certain irrigated area would not necessarily reach the river immediately adjacent to that area.

Q. If the testimony in this case shows that the waters from each of the ditches going down stream in succession returns to the river above the headgates of the next lower ditch, and if there are half a dozen of these ditches, and they do take all of the water during the irrigating season, would it not be true that all the water that could come back into the stream as return waters and flow on down through the State of Kansas would be the return water from the last ditch? (Objection by defendants.)

A. Well, assuming that all those facts were proven, my experience would be—but that condition, however, would not be possible—but assuming they were proven, that state of facts or alleged facts would inevitably lead to the conclusion that that would be all the water that would be going into Kansas.

Recross-examination on behalf of defendants.

By Mr. DAWSON:

Q. If however, the evidence in the case does show that the flow of the water in the Arkansas river in western Kansas during the dry period of the year has been constantly increasing since the irrigation of lands in eastern Colorado along the river, would that more nearly accord with your experience on that character of stream where irrigation is practiced?

A. That is what I would expect to find, from my experience on irrigated streams.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4535 I have no personal knowledge as to whether the Arkansas river is a dry stream during the greater part of the year during recent years through the western portion of Kansas.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

4536 The eastern limit of the arid region is a moveable standard depending upon the precipitation of any one particular year, but about the 98th to the 100th meridian is assumed, I believe, generally, to be its eastern limit, and it was this entire region we had in mind when the reclamation act was passed, and its purpose and object were to develop the entire arid region irrespective of any State or Territory.

The Pathfinder reclamation project on the North Platte in Wyoming that I testified in regard to is situated on the North
4537 Platte river which flows into Nebraska. The eastern part of Nebraska is humid and they raise crops without irrigation. The Pathfinder project is intended for the irrigation of lands in Nebraska and Wyoming, and has been proceeded with by the reclamation service to a point where it is their opinion that
4538 they will probably irrigate more lands in Nebraska than in Wyoming, or at least as large an acreage. The irrigation of the lands irrigable from this reservoir in Wyoming, the sale of water rights at a price which could be obtained under present conditions, would not warrant nor justify the construction of works under a law which requires that the outlay be reimbursed and returned to the fund; and if the law of riparian rights were in full force and effect in western Nebraska it would be impossible to divert the river or utilize the waters impounded in this reservoir in that region; and that being true the construction of the enterprise as a whole could not be accomplished.

Since I went to Wyoming in 1887 the population has increased and the property value also. I think that probably two-thirds to three quarters of our increase in population during that time has been due directly and indirectly to irrigation. I think the State has more than doubled in population since I went there. I should say that the increase in property values during that time has
4539 nearly trebled. In other words, the population has increased and property has been created and the value has increased in proportion as the irrigated area has increased since I went there. Of course there have been other factors.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

I understand that is true that there were vested rights down in the eastern part of Nebraska and property built up there before this reclamation act was passed. There were towns there of some size. and there are some smaller towns. I don't mean to say and don't wish such an inference to be drawn from my testimony that in passing this reclamation act we were going to irrigate that western arid land regardless of the question as to whether it might destroy all

that prior civilization and property in the eastern part of Nebraska and on the lower part of an inter-state stream. (Objection
4540 by defendants.) The act is to be carried out when the rights of all parties are properly considered.

4541 FRED T. DUBOIS, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I have resided in Blackfoot, Idaho, between twenty-four and twenty-five years. I am United States Senator from that State. I have served ten years on the 4th of March next. Before that I was a Delegate in Congress and was United States marshall for four years. I am generally familiar with the conditions prevailing in that State.
4542 About two-thirds of Idaho is in what is known as the arid belt. There is north Idaho and south Idaho. The north part is about one-third of the State, and in that section of the country they raise splendid crops without the aid of irrigation. In many sections of this arid belt in Idaho crops cannot be raised without the aid of irrigation. I would qualify that a little by saying that there is what is called dry farming in some sections of the State, but it is very precarious and cannot be depended on at all. They only raise half a crop one year and not half a crop at all for several years. In the arid portion of the State, except in the middle center of south Idaho, where there are large lava beds, the lands are sufficiently rich to raise a crop provided you can get water on it. About a million acres of arid land I should say have already been reclaimed in the arid portion of Idaho. It is worth at least $40 an acre.
4543 I think the assessed value of real estate, outside of any improvements at all, in 1904, was twenty-six or twenty-six and a half million dollars, and two-thirds of that I should say was produced by irrigation. In this answer I confine it to the real estate alone. Of this million acres of land which has been so reclaimed by irrigation I should say three-fourths of it if not nine-tenths
4544 has been reclaimed since I went to Idaho. It was worth nothing before it was reclaimed. Its value now runs all the way from $25 to $1,000 an acre, so when I say that $40 an acre is an average price I am putting it pretty low. Lands in northern Idaho could not be used as fruit lands except through irrigation, and they are worth $1,000 an acre. The fruit lands around Boise are the greatest in the United States, not excepting California, and are worth anywhere from $100 to $400 an acre.

No, all the lands which can be irrigated have not been reclaimed. We are just starting in. By using the unused waters and impounding and storing the flood waters I would say that we could add
4545 four and a half million acres to what we have. This land is not worth anything now. In some years and some places it

is good for grazing. If these lands I have spoken of were irrigated and intensively farmed I would say they would be worth $40
4546 an acre on the average. The Government now has under process of reclamation land near Minidoka, in Idaho, somelike one or two hundred thousand acres, and it will cost the Government $26.50 an acre to reclaim it, At Twin Falls, Idaho, a private company has gone in under the Carey act to reclaim some 280,000 acres of land, for which they charge $25.50 an acre, and all of it is being taken. The additional property which can be created by reclaiming arid lands, independently of the lands themselves, will be almost as much or as much as the value of the lands themselves. It would create all the value of town property and manufacturing enterprises and all sorts of things. My colleague in the House
4547 when I was a member of that body, Mr. Wilson, reclaimed a raw piece of land, I think sixty-four acres. He sold it a couple of years ago for $24,000.

The whole country from Boise down to Payette has been reclaimed during my time. There were no fruit lands at all when I went overland the first time in a stage from Blackfoot to Boise; now there is one succession of fine fruit lands. The instance I have referred to in respect to Mr. Wilson has been repeated throughout Idaho.

Before going to Idaho I lived in Illinois. The land in Idaho which is irrigated is much richer than the Illinois land. It
4548 raises more of everything per acre—more in quantity and larger kernels. The average yield of wheat in Idaho as compared with Illinois I should say is double per acre, and this rule holds good with reference to other crops which are peculiar to the soil of our State.

Yes, I think there is no question but that the same amount of irrigated lands in Idaho will support a denser population than in Illinois.

If it were established that the water in the streams of our State should be obliged to flow down the stream undiminished in quantity and unaffected in quality except as it may be diminished in quantity or affected in quality by reasonable use above for manufacturing or domestic purposes, the land already reclaimed could not have been reclaimed; and if such a doctrine were to apply I can't see
4549 how any of south Idaho could be developed at all. We are dependent absolutely on irrigation. Unless we could take the water out of the streams and use it on the land there could not be any more development in South Idaho.

Should it be established that the irrigated area in Idaho should be confined to the lands bordering upon or adjacent to the stream, say within three-quarters of a mile thereof, it would be almost as detrimental as a total denial of the use of the water. In respect to the lands already irrigated, there are not a thousand acres of land within three-quarters of a mile of the stream from which they
4550 are irrigated. Of course that is just a guess; but it is a small amount comparatively.

Yes, I am familiar with the act known as the Carey act, passed by Congress August 18, 1894. I had the honor of helping to prepare it. I was chairman of the public lands committee, I think, at that time. Judge Cary and I are the ones who took the most interest in it, and I am quite familiar with it. Yes, the State of Idaho accepted the provisions of that act very quickly. If I am not mistaken, we were the first State to do so, unless it was Wyoming. Under the provisions of that act there has been expended and is in process of being expended I should think in the neighborhood of four million dollars. I think there has been taken up under that act between four
4551 and five hundred thousand acres.

The doctrine of riparian rights, if it were enforced in Idaho, would destroy the effectiveness of the Carey act, practically. There are two of these Carey act projects in Idaho, which are small, that might be operated, but none of them which get their water from Snake river would be worth anything at all. You couldn't do anything with them. Such a doctrine would destroy the lands already irrigated. They could not get the water supply.

Yes, I was a Senator from Idaho when the reclamation act of 1902 was passed. I had a good deal to do with that act also. I was on the committee of seventeen and presided over most of the meetings of the committee. This act was passed for the entire arid and semi-arid region. Should the doctrine of riparian rights be enforced in Idaho it would reduce the amount of money which could be
4552 put into that reclamation fund by at least two-thirds. It would stop the taking of any land in south Idaho. You cannot impound sufficient water to irrigate successfully without a stream, of course, that is, any very large amount.

There is a necessity for the cultivation of forestry in Idaho. I don't think it could be successively cultivated there without irrigation. I think it would be impossible. Of course when I speak of Idaho I am speaking of south Idaho.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4553 About two-thirds of Idaho is arid and about one-third is humid. In the northern one-third crops can be raised without irrigation. I think crops have been raised without irri-
4554 gation since about 1863. In northern Idaho the agricultural pursuits were merely an incident. The people went there first for mining purposes. Our irrigation was begun before the Carey act of 1894. The Carey act did not help us a great deal.
4555 The Snake river rises in Wyoming, and where it crosses the State line into Idaho it is a very considerable stream.

Bear river rises in Idaho and flows out of the State into the great Salt Lake.

The Kootenai river, in the north, runs from British Columbia into Idaho and out again.

There is no irrigation in Idaho along the Snake river near
4556 the Wyoming line. The waters of Snake river have their source in Wyoming and irrigate the lands in south Idaho. I think there are no large tributaries within the Wyoming line and the upper portion of the irrigated section in Idaho. The waters of the Snake river that we use for irrigation in Idaho rise in Wyoming, until you get down to the town of Blackfoot, which is a hundred miles before the irrigated country commences. If the
4557 course of the Snake river in Wyoming could be changed and the waters of the Snake river should be diverted in Wyoming it would be exceedingly damaging to south Idaho. (Objection by defendants.) Roughly speaking, I should say that three-fourths of the irrigation in south Idaho is dependent on the Snake river.
4558 Oh yes, it would very materially interfere with irrigation in Idaho to have all the waters of the Snake river diverted in Wyoming. There is no irrigation on the Snake river in Wyoming at all. If the State of Wyoming, by virtue of her sovereignty and her constitution and laws should claim and exercise the right to divert all of the waters of the Snake river within her borders, allowing none to flow down into Idaho, it would almost totally destroy the irrigation interests in Idaho. (Objection by defendants.) Of course as a physical fact they could not divert the waters of
4559 the Snake river in Wyoming. I do not think it was contemplated by the reclamation act that the crest State should have the right to subsequently take all the waters of an inter-state stream to the damage and detriment of prior property interests in the lower State. (Objection by defendants.) It was not thought by those who framed the reclamation act that the crest State should have the right by virtue of her State sovereignty to own and control al of the waters of an inter-state stream that rises within her borders to the detriment and injury of prior appropriators or prior prop-
4560 erty rights along the streams below those crest States. (Objection by defendants.) That was not the intent of the act. (Objection by defendants.) I am very firmly convinced that the flood waters of those streams can by proper provisions be very largely conserved to the general benefit of the people of those regions, and this could be done so as to preserve the property interests or
4561 prior and vested rights along the streams below. There is no question but what the framers of the reclamation act expected and intended by the act to enhance the value of property held by individual owners by the building of these reservoirs, and we thought that this could be done so as to benefit all and practically injure none.

Cross-examination on behalf of defendants.

By Mr. DAWSON:

The amount of precipitation varies greatly in Idaho between the northern third of the State and the southern two-thirds. There is

a border land between the arid and humid regions of the State which may sometimes grow crops without irrigation but only can be made to grow them surely and profitably by irrigation. It is true that the experience of farmers in Idaho has shown that the use of water for irrigation can with advantage be pushed farther and farther north. There are lands around Lewiston, Idaho, for instance, where they will grow crops five or six years in succession without a failure, and very good crops, and then they will
4562 have a failure, maybe, for a year or two. They raise grain on those lands, and they are worth from $30 to $40 an acre. Put water on the same lands and they are worth $1,000 an acre, because they make fruit lands out of them then. And the putting of the water on the lands not only directly enhances the value of them but tends to divide the holdings into smaller tracts and bring about intensive farming. Five acres of irrigated land around Lewiston is plenty to support a family, and they can lay by money. They do it.

There are large streams that commence to empty into the Snake river about Blackfoot, and the supply of water is very great from that point. Within a comparatively short time the far greater portion of the irrigated lands was above Blackfoot, but now there is in process of construction the Minidoka project of the Government, the Twin Falls project under the Carey act, and other projects of that sort. The Government enterprises are large. But even at the present time the great bulk of the irrigated land is between Blackfoot and Wyoming. When the projects are completed it will still always be in favor of the country between Blackfoot and Wyo-
4563 ming because they have withdrawn a great deal of their land between those points and the Government intends to build great reservoirs. It won't come from the Snake river proper, but it will come from these great reservoirs. So that that part of the country is bound to grow as fast as all of the balance, I should think. They are not doing any considerable amount of irrigation from the Snake river, and they can't. I went over that personally and carefully. I was in hopes they could, and wanted to find where we could divert water. It looked to me to be a shame to take all of the water in Wyoming and use it in Wyoming. But there was no place it could be done. And they can't use it in Wyoming to the injury of Idaho. Even if they could have found some way to take some of it out and put it on the lands adjacent to the streams, we would not be
4564 afraid of that.

My observation has taught me that the irrigation of large tracts of land within the water shed of a stream tends to equalize the flow of the stream farther down, making the maximum flow less and the minimum flow or dry time flow greater, and that fact in itself in a large measure would protect us from any injurious effects from irrigation in Wyoming, even if they could use the water. Now, after they take out all of this water from Snake river proper—Snake river not being fed by other streams—by the time

we get to Blackfoot the water is pretty low in Snake river in the middle of the irrigating season, but down below there there is plenty of water used, farther down on the Snake river. I should think that where streams were made practically dry by the subtraction of water for irrigation that farther down would show a good flow of water, this must, on account of physical conditions, be ac-
4565 counted for by the return or seepage waters from the lands irrigated.

By the passage of the reclamation act we had in view that we would furnish more water, so that if a man had a farm of four or five hundred acres and only water enough for a hundred, by being economical he could get more water. We could supplement his supply and make it certain.

The irrigation of land in large quantities in itself is a system of reservoiring water. The irrigating season is such that a great deal of irrigating is done all along the mountain streams with which I am familiar at a time of year when there is a flush flow of water in the stream, and after the water is taken from the stream and placed upon the land at a time of flush flow the return of that water through the soil to the stream is slow as compared with the surface water, and the result from that is not so appreciable in the effect upon the stream at a later period in the irrigation season when the
4566 stream is low in its natural flow. The waters which have been spread over the land during the early season when the r[illegible] is at a flush flow have something to do with the maintenance of [illegible] flow at a later period in the season when the stream naturally would be low. I didn't understand that. That is the only source of supply, I think, for the stream, apparently. It comes after the snows are melted and the natural supply is expected and the stream is replenished, I should think, from water that has been put upon the ground. I know that from my personal observation of irrigated countries. Yes, I should say so. I should say I know it from personal observation.

It takes a much less number of acres of irrigated land in Idaho to maintain a family than in the unirrigated lands of the agricultural States. It is hard to put that in some proportion, because when you come to these extremely rich fruit lands of Idaho, for instance, you can hardly make any comparison, and you take the ordinary farm lands, where they raise wheat and hay and ordinary farm products, I should think one acre would support as many as two acres would at least in the other States. And that is
4567 excluding the very high production in fruit lands and truck gardens. In cantaloupes, you know, we raise as high a quality in Idaho as they do in Colorado.

I rather account for the great difference in precipitation over the northern one-third of Idaho as compared with the southern two-thirds from the fact that they are closer to the Pacific ocean and the warm streams of the Pacific ocean. They are clear on the other side of the mountain ranges, and I think the warm streams of the Pacific

have quite a good deal to do with it. The northern one-third is also a heavily timbered country. The southern part is very sparsely timbered, except in spots. In Payette and Boise counties there is some fine merchantable timber, but generally in south Idaho the timber is not very fine, while in north Idaho it is the finest in the United States.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4568 In speaking of the fact that we had no fear of the waters being taken by the people of Wyoming, I will say that our relations with the people of Wyoming and Colorado have always been very harmonious and pleasant, and always will be. (Objection by defendants.) The water of the Snake river is taken out and spread on the lands for irrigation purposes all at the same time, and it does lower the river to do that. The water is supplied below by tributaries and the seepage of the water back.

I did not understand that I was answering a question put by counsel for defendants that in shaping this reclamation act we thought that by taking all of the water above the people's
4569 interests would be protected in the States below solely by return waters. (Objection by defendants.) I didn't understand I was answering any such question. Such a reliance would certainly not be a full protection to the people below if the people in the upper State took all of the waters of those inter-state streams. (Objection by defendants.) If any set of people took all of the water before it came to a second set of people, the second set would not be benefitted very much.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

4570 There is one project under the reclamation act of 1902 in the southern part of Idaho. Contracts have been made involving an expenditure of $26,000. This is called the Minidoka project, along the Snake river. There is another which contemplates an expenditure of $600,000. As to the number of acres this project could reclaim, I cannot tell. I can only say that it is contemplated it will cost $26.50 per acre. They divide the costs per acre and charge $26.50 per acre.

4571 JOSEPH M. DIXON, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside at Missoula, Montana. I am a member of Congress from that State. I have been reëlected to the 59th Congress. I have

lived in Montana for fourteen years, in Missoula. I am an
4572 attorney. I am very well acquainted with the conditions prevailing in Montana, and have been over every county in the State.

The rainfall in Montana is not sufficient to raise a crop without irrigation. The number of irrigated acres in 1889 in Montana was 951,154. I think at this time it would be considerably in excess of one million acres. We do not assess our mines in Montana, which is in
4573 reality one or our principal sources of wealth. We only assess the output of the mines. The assessed valuation of the State, exclusive of mines, for 1902, was as follows: Real estate $86,451,577. This does not include railroad assessment. It includes houses and lots in cities and towns, however. Over one-half the assessed valuation is based on irrigation. The figures I have just given do not include the valuation of personal property in the State, only real estate. Yes, there are other lands in Montana that can be added to this irrigated area. I am told by engineers it is possible to irrigate eight million acres additional in that State; in other words, eight times as much as are now being irrigated. From my observation in Montana I think the judgment of these engineers in this
4574 respect is correct. The ordinary unirrigated lands in Montana at this time I would say on a fair valuation would not exceed $1.25 an acre. In regard to the worth of these lands in ten years after they are irrigated, I would say that I personally *I* know a tract of three thousand acres which was put under ditch this last year which is selling on the market at $35 an acre after water has been placed upon it, without any improvements whatever.
4775 The tendency is to increase the value of irrigated lands in Montana. I think if these eight million acres were reclaimed it would support a million people directly and indirectly. There has been considerable development along irrigation lines in Montana since I went there fourteen years ago. Without any statistics to go by and based upon my personal observation, I should say we are irrigating now three times as much as we were when I went there. We are adding to the irrigated area every year. The population is increasing every year in direct ratio to the amount of irrigated lands. The population of Montana has trebled since I went there.

4576 The development in Montana which has already been made could not have been made if the doctrine of riparian rights had been in force, except as to a very narrow margin immediately along the banks of the stream by the riparian owners. As to the effect upon future development, it would absolutely prohibit any further development except as to possible new mineral discoveries. If the irrigated area were confined to the lands within one-half or three-quarters of a mile from the banks of the stream it would put a complete stop to any further development. As to present development, should the doctrine of riparian rights be strictly enforced it would destroy three-quarters of the farming lands of the State.

It would reduce the present population of the State one-half, in my judgment, as it would leave us purely a stock raising country.

The State of Montana has accepted the provisions of the act of Congress known as the Carey act. Not much development
4577 has been done under it so far.

I am familiar with the reclamation act. When I said a few moments ago that eight million acres of land could be added to the irrigated area in Montana I had reference to what could be done under the reclamation act of 1902. Some land could be irrigated by private enterprise, but not a great amount. The enforcement of the doctrine of riparian rights, as I understand it, would nullify the operation of the reclamation act.

Should it be established that the irrigated area must be confined to lands within half or three-quarters of a mile of the stream, this doctrine would practically nullify the provision of the reclamation act.

4578 Yes, I think fifty per cent. of the present development in Montana depends upon irrigation, and practically all of the future development. We raise wheat, oats, barley, rye, potatoes and the root crops. My experience has been that irrigation has very largely increased the amount of crops per acre in the West as compared with farming in the Mississippi valley. I know that our averago per acre of grain crops is about double on the irrigated lands in my State as compared with the farming lands in the Mississippi valley. I had occasion to take up this matter and investigate it.

There are four or five Indian reservations in Montana, and
4579 the Indians thereon are dependent upon the irrigation of lands for their support, and upon stock raising. If the Indians were forbidden to use the waters of the streams for irrigation upon these reservations, nowhere except on a part of the Flathead reservation in western Montana could they develop crops.

4580 There is a necessity for the cultivation of forestry in a portion of the State where timber does not exist—on the eastern slope, from the crest of the Rocky mountains to the Dakota line. Forestry could not be successfully cultivated without the aid of irrigation in Montana. The rainfall there on the eastern slope of the Rockies, which covers about two thirds of the area of the State, is about thirty inches, and I think about twenty inches on the west side of the mountains. On the east side it comes mostly in May and June. From June on during the period of crop growing there is practically no rainfall, and at the time we need rainfall for crop purposes we have very little.

4581 Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

The streams flowing through Montana mostly rise within our own territory, except on the southern boundary of the State. Some of them rise in Wyoming. The Milk river rises in Montana, flows

into Canada and then back into Montana. The Kootenai, in western Montana, rises in British Columbia. The irrigation along the Milk river in northern Montana comes from the Milk river. There is considerable irrigation in southern Montana along the Big Horn and Clarke's fork, which rise in Wyoming in the Crow Indian reservation, and the Crow Indians under Government supervision have expended about $600,000 in the digging of irrigation ditches
4582 on the Big Horn, which rises in Wyoming. If Wyoming should claim the right and exercise that right to take all of the waters that flow in the streams that rise in Wyoming and then subsequently flow into Montana and divert those waters in the State of Wyoming, it would paralyze the irrigation on those streams in the State of Montana. It would put a stop to it. (Objection by defendants.) There is a little irrigation in Montana on the Milk river before it goes into Canada, and after it comes back from Canada there is considerable. There is a large Mormon colony that went into Alberta some years ago and settled that portion of the
4583 country through which the Milk river runs, on the Canadian side. If the citizens and residents of Canada should take all the water of the Milk river while in the territory of Canada it would be absolutely fatal to the further development of irrigation upon the Milk river in Montana after it returns to Montana. (Objection by defendants.) In fact the members of Congress from Montana have had this matter up with the Secretary of State and are trying to arrive at some agreement with the Canadian government at this time. There is a large irrigation project embracing, as I now remember, about 400,000 acres of land along the Milk river, which has been held in abeyance on account of the complication over the waters of the Milk river being threatened by the Canadian settlers on the Canadian side, and this controversy is pending at this time between the British government and the United States Government. There has been a protest made on the part of the citizens of Montana against the taking of the flow of the stream in Canada to the detriment of citizens who have made prior settlements in the State of Montana. The State Department has taken the matter up. The larger part of the water has been appropriated on the American side prior to
4584 the settlements in Canada. If the State of Montana should appropriate and take for irrigation all of the waters that rise in Montana and flow into the Dakotas in the Missouri and Yellowstone, on the Montana side, and use them there, the people of North Dakota, of course, would have no river when it got down into the Dakota territory. (Objection by defendants.) This would depreciate their property and their interests. In saying that I was in favor of a large and beneficial use of the water in Montana for irrigation I do not wish to be understood that I was in favor of such use as would destroy prior civilization in other and lower States.
4585 (Objection by defendants.) In carrying out the projects in process of development under the reclamation act and the reclamation service, we would have to recognize the prior right of

the appropriator in the State lower down the stream. That
4586 would be the equitable method. So taking all of the water of those streams in Montana would affect power rights and the rights of navigation in North and South Dakota; and I should think to some extent the river courses have some effect upon the humidity of the atmosphere. (Objection by defendants.) In Montana the irrigation that has been done in eastern Montana along the river courses or the rivers that flow into Dakota has not yet diminished to any appreciable extent the waters of those rivers.
4587 (Objection by defendants.) Yes, it might be carried to such an extent as to appreciably diminish them, and we hope some time to practically dry up the Yellowstone and Missouri. The conditions are such that an extensive system of irrigation can be carried on. Yes, and in doing so we might affect the business interests and property interests of the lower States. I think it is the grand scheme of the Irrigation Bureau people to divert the Missouri, which includes the irrigation of both Montana and North Dakota, along the Missouri in North Dakota. I think that it would not be equitable in carrying out these systems of irrigation under the reclamation act for one State, by virtue of its sovereignty and constitution, to control all of the waters that rise in that State regardless of any injurious effect it may have on prior settlements, prior property interests and prior vested rights in the lower States.

4588 Cross-examination on behalf of defendants.

By Mr. MILLER:

I know of numerous small streams that have been completely emptied by irrigation in the State of Montana, and I believe that the application of water to irrigation in the arid State of Montana or elsewhere can be applied to the extent of emptying the stream if it is beneficial to the agricultural interests of the country; and in referring to the equitable doctrine concerning injury to prior rights, including cities and industries and such, I referred to those that are dependent upon the existence of a prior appropriation of water by some diversion. None of our appropriations have interfered or will interfere with navigation, and they cannot do so. Of course we recognize under our irrigation laws the rights of prior appro-
4589 priators for power purposes, the same as we do for the purpose of irrigation.

My observation and experience with reference to the effect upon the supply or constancy of the supply of water in the stream by taking the water out and spreading it over the land is that it makes the stream more permanent and the flow more even, usually, lower down the stream. Of course of the smaller streams it practically dries them up where the irrigation is done, but it seeps back lower down the valley usually.

The application of water to irrigation in Montana requires the diversion of water, and the conducting of it some distance back from

the stream, farther than would obtain under the riparian doctrine, and it is so applied. If it were not possible to use the water at remote places from the stream it would result in the destruction of the greater part of the agricultural lands and their profitableness.

The chief irrigated districts of Montana are along the valley of the Yellowstone in eastern Montana. At the city of Billings in particular, I should think within twenty-five miles of that city, there is 100,000 acres under irrigation; along the Clarke's Fork valley in Carbon county, below Red Lodge, there are several thousand acres under irrigation from that stream; on the headwaters of the
4590 Gallatin river in the Gallatin valley, around Bozeman, there is an area of country twenty miles square; on the west side of the mountains, in the Bitter Root valley, near the city of Missoula, there is a valley approximately sixty miles long and averaging six miles in width and nearly all under irrigation from the tributaries of the Bitter Root and from the main river itself; in northern Montana, alone the Milk river, near Chinook and Harlem, there is a large area of country under irrigation. There is, near Helena, considerable country under irrigation from the headwaters of the Missouri. These are the principal centers of irrigation in Montana at this time.

Irrigated lands with a permanent, absolute water supply will readily sell for $35 an acre in the raw, uncultivated state. From that price up to $100 an acre with improvements. And this is due to the application of water to the lands for agricultural purposes. That same land before being irrigated would not be worth
4591 over one or two dollars an acre.

The experience has been that after some years of irrigation it does not take so much water per acre to irrigate the same land. It is true that there is a constant return of water along the the stream which can be applied farther down to the irrigation of land. Of course it largely diminishes, but the seepage from the irrigation farms, some of it gets back into the stream, and that that is taken out is again applied. Of course the greater part of it evaporates through the irrigation of the land. Some of it seeps back to bed rock and finds its way back. That depends a good deal on the condition of the land and the geological formation of the bed rock of the country. Some of the feeders of the Milk river are in
4592 Canada. There is no navigation on the Missouri river in Montana at this time. The boats used to run to Fort Benton, but they only ran during the flood water of the summer months. The boats ran up to Benton until about 1882, until the Northern Pacific railroad was built there, when navigation stopped. There are no boats at the present time, I think, on the Missouri river in Montana. I think there is very little navigation on the Missouri river, even through the Dakotas.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

This navigation through the Dakotas on the Missouri river has stopped because it was only carried on for two or three or four months in high water anyway. It was done under a great disadvantage, and the building of the trans-continental lines of railroad put a stop to it.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

4593 Of course it would not be practicable to dry up the Yellowstone and Missouri rivers. When I made that statement I was speaking more in generalities. Oh no, it would not be possible to use the waters of Montana in either of these streams so that they would not be coming down in the channels. There would some be left in the streams by reason of the seepage from the little tributaries along the banks, and the natural drainage of the country. Nearly all of the ranchers through the northern part of the State are constructing small reservoirs and small irrigation enterprises on their own farms. The lands themselves act as a sort of natural reservoir when irrigated. They act as a sponge to some extent. Yes, the returning seepage waters are increasing year by year, and there

4594 is a more intelligent application of the waters for irrigation being made from year to year. The seepage increases as long as the country is irrigated. The more intelligent application of the waters to lands for irrigation purposes the greater the increase in the return seepage. The building of reservoirs tends to make the flow more continuous. I know of one stream personally in the Bitter Root country where they have a reservoir at the head of it. I think it usually went dry in the early part of August. The building of the reservoir lets some of the water down practically in September now. It is a big sponge that it drips through.

Recross-examination on behalf of complai-ant.

By Mr. ASHBAUGH:

The Milk river is a hundred yards or more across the flow of the water in that stream.

Recross-examination on behalf of defendants.

By Mr. MILLER:

The diversion of water for placer mining and for the concentration mills is absolutely necessary.